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(71) Applicant: SPECTRA PHYSICS INC.
3333 North First Street
San Jose California 95134-1995(US)

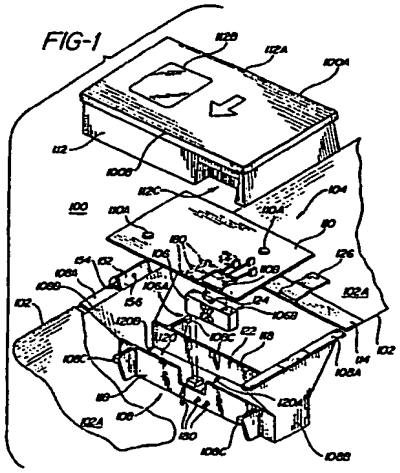
(72) Inventor: Taussig, Andrew Peter
2515 West 22nd Avenue
Eugene Oregon 97405(US)
Inventor: Isaacs, Blake L.
748 Granite Place
Springfield Oregon 97477(US)

(74) Representative: Murgatroyd, Susan Elizabeth et al
Baron & Warren 18 South End Kensington
London W8 5BU(GB)

(54) Data gathering system interface.

(57) A data gathering system (100) for use in a checkout counter (102) to determine information relating to products to be purchased and to provide such information to a cash register system includes a scale (104) supported within the checkout counter (102) for determining weights of products presented to the data gathering system (100). The scale (104) includes a subplatter (110) located below the upper surface of the checkout counter(102). An optical scanning arrangement (112) is supported on the subplatter (110) for reading coded labels on the products. A common interface circuit (200) is responsive to both the scale (104) and the optical scanning arrangement(112) for providing weight data and coded label data to the cash register system.

FIG-1



EP 0 388 560 A2

DATA GATHERING SYSTEM INTERFACE

The present invention relates generally to data gathering systems for use at point of sale checkout counters and, more particularly, to a data gathering system which comprises an optical scanner supported on a weighing scale, and support means for suspending the system within a counter such that the optical scanner provides a weighing platter for the scale at an upper surface of the counter. Thus, bar coded data imprinted upon product labels presented at the counter can be read by the optical scanner, and the weight of such products can be determined by placing the products on the optical scanner. In effect, the optical scanner becomes the weighing platter of the scale. The bar code data and the weight data are supplied to the cash register system via a common interface.

Supermarket checkout counters commonly include optical scanners mounted therein for optically scanning bar code labels on products to be purchased as the products are moved over scanning windows in the top surfaces of the scanners. The scanners read and convert the bar code labels into product identification and pricing information which is used for the sale and other merchandising purposes, such as inventory control. Since many products sold in supermarkets, for example produce, are sold by weight, oftentimes weighing scales are also positioned adjacent the checkout counters. The weighing scales can be manually operable such that sales clerks weigh products and then enter the resulting prices on associated cash registers. Alternately, the weighing scales can be partially or fully automated such that the weights and resulting price information are directly passed to the registers.

One example of an automated data gathering system is disclosed in U. S. Patent No. 4,656,344, wherein a scale and an optical scanner are not only directly interconnected to an associated register but also are integrated into a single unit which fits within the checkout counter. While this integrated scale/scanner system offers advantages over the prior separated component systems in terms of convenience and space savings, still there are disadvantages and inconveniences associated with the integrated system. For example, by making the scale and scanner a single integrated unit, the system is heavy and difficult to install and/or remove from a receiving checkout counter. Adding to this problem, the system must be removed from the checkout counter each time the scale is to be zeroed or calibrated and then the system must be reinstalled.

The need for a data gathering system for use at a point of sale checkout counter which provides for both scanning coded labels and also weighing products which are to be sold by weight has been recognized, and a combined scanner and scale which meets this need is the subject of the above identified, commonly assigned, U.S. Patent Application entitled Scale Having Platter Including Removable Optical Scanner (Docket SPR 029 PA). The combined scanner and scale accomplishes is provided in a compact packaging arrangement which eases and facilitates removal and installation of the system for maintenance and repair.

It will be appreciated, however, that since the scanner and scale both communicate with the cash register system, such as for example an IBM Model 4683 System, it is necessary to provide for a communications interface between both of these components and the cash register system, even though the components are physically combined. Not only has this required redundant interface circuitry, but the use of redundant cabling, and interface ports in the cash register system. It is seen, therefore, that there is a need for an interface arrangement which avoids the difficulties heretofore encountered.

This need is met by a data gathering system according to the present invention for use in a checkout counter to determine information relating to products to be purchased and to provide such information to a cash register system. The data gathering system includes a scale means supported within the checkout counter for determining weights of products presented to the data gathering system. The scale means includes a scale weighing platter located below the upper surface of the checkout counter, optical scanning means supported upon the scale weighing platter for reading coded labels on the products, and a common interface circuit, response to both the scale means and the optical scanning means, for providing weight data and coded label data to the cash register system.

The scale weighing platter includes scanner locator means for positioning the optical scanning means on the scale weighing platter for assembly of the data gathering system. A support means is provided for suspending the data gathering system within the checkout counter. The scale means is secured to the support means.

The optical scanning means includes a bar code decoder circuit for decoding scan signals to provide coded label data, a scanner microprocessor for correlating coded label data and supplying the coded label data to the common interface circuit, and scanner memory means for storing control software for use by the scanner microprocessor.

The scale means may supply weight data to the bar code decoder circuit of the optical scanning means, and the bar code decoder circuit then supplies the weight data to the common interface circuit via the scanner microprocessor without alteration. Alternatively, the scale means may supply weight data directly to the common interface circuit.

The common interface circuit comprises an interface microprocessor, responsive to coded label data from the optical scanning means and to weight data from the scale means, interface memory means for storing control software for use by the interface microprocessor, and a driver circuit, responsive to the interface microprocessor, for supplying weight data and coded label data to the cash register system.

The data gathering system according to the present invention for use in a checkout counter determines information relating to products to be purchased and provides such information to a cash register system, including weight data and coded label data. The counter defines an upper surface upon which products are placed for access to the data gathering system. The data gathering system includes support means for suspending the data gathering system within the checkout counter, and scale means secured to the support means for determining weights of products presented to the data gathering system. The scale means includes a scale weighing platter located below the upper surface of the checkout counter. An optical scanning means is supported upon the scale weighing platter for reading coded labels on the products. The optical scanning means has an upper surface including an optical scanning window, and is sized such that its upper surface is substantially aligned with the upper surface of the checkout counter when supported upon the scale weighing platter. The data gathering system includes a common interface circuit, responsive to both the scale means and the optical scanning means, for providing both weight data and coded label data to the cash register system.

The scale weighing platter may include scanner locator means for positioning the optical scanning means on the scale weighing platter for assembly of the data gathering system.

The optical scanning means includes a bar code decoder circuit for decoding scan signals to provide coded label data, a scanner microprocessor for correlating coded label data and supplying the coded label data to the common interface circuit, and memory means for storing control software for use by the scanner microprocessor.

The scale means supplies weight data to the bar code decoder circuit of the optical scanning means, and the bar code decoder circuit supplies the weight data to the common interface circuit via the scanner microprocessor without alteration. Alternatively, the scale means supplies weight data directly to the common interface circuit.

The common interface circuit comprises an interface microprocessor, responsive to coded label data from the optical scanning means and to weight data from the scale means, memory means for storing control software for use by the interface microprocessor, and a driver circuit, responsive to the interface microprocessor, for supplying weight data and coded label data to the cash register system.

The data gathering system may further included cables connected between the scale means and the optical scanning means for conducting electrical signals and power, the cables being sized, positioned and secured to prevent interference with the operation of the scale means.

Accordingly, it is an object of the present invention to provide an improved combined scale and scanner system in which communication with a cash register system is facilitated; to provide such a combined scale and scanner system in which a single interface communicates between the scale and scanner, and the cash register system; and to provide such a combined scale and scanner system in which the interface is microprocessor controlled.

In order that the invention may be more readily understood, it will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is an exploded perspective view of a data gathering system in accordance with the present invention for use in a checkout counter;

Figs. 2-4 are top, side and end views, respectively, of the data gathering system of Fig. 1; and

Fig. 5 is an electrical schematic representation of the common interface circuit, and associated circuitry, which is response to both the scale means and said optical scanning means, and which provides weight data and coded label data to the cash register system.

Reference is now made to the drawings which show a data gathering system 100 in accordance with the present invention. The system 100 is designed for use in a point of sale checkout counter 102 and fits entirely within the counter 102. The system 100 is structured as two separate units which can be independently manufactured, packaged and shipped and also individually handled and installed. By structuring the system as two separate units, it initially can be easily installed in the counter 102 and thereafter easily removed and reinstalled for system maintenance and repair. Further, the scanning operation can be more easily and accurately performed since scanning light beams pass through a single

scanning window as opposed to two or more windows and/or apertures in prior art systems.

The close proximity of the two separate units facilitates the transmitting both weight data and coded label data to a cash register system, such as for example an IBM Model 4683 cash register system. The data gathering system 100 conveniently provides for both reading bar-coded labels secured to products to be purchased and also weighing products which are placed upon the upper surface of the system.

This data is then sent to the cash register system via a common interface circuit, as will be explained more fully below. Not only does this utilize the system circuitry in a most efficient manner, but also reduces the amount of coaxial cabling and the number of cash register system input/output ports required. The data gathering system 100 comprises scale means, taking the form of a load cell scale 104 in the illustrated embodiment, which is supported within the checkout counter 102 by support means and provides for determining weights of products presented to the data gathering system 100. The scale 104 comprises a cantilever beam load cell 106 secured at one end 106A to the support means which comprises a support cradle 108 in the illustrated embodiment, and to a scale load receiving plate or subplatter 110 at its opposite end 106B. The subplatter 110 is located below the upper surface 102A of the checkout counter 102 as best shown in Figs. 3 and 4.

Optical scanning means comprising a self-contained optical scanner 112 is supported upon the scale subplatter 110 for reading coded labels, such as bar-coded labels, on products presented for purchase at the checkout counter 102. The optical scanner 112 has an upper surface 112A including an optical scanning window 112B through which scanning light beams pass and is sized such that its upper surface 112A is substantially aligned with the upper surface 102A of the checkout counter 102 when the optical scanner 112 is supported upon the subplatter 110. The weight of the optical scanner 112 is subtracted from the weight which is measured by the scale 104 or treated as a tare weight for the scale 104 such that the upper surface 112A of the optical scanner 112 serves as an extension of the subplatter 110 for receiving products to be weighed.

The subplatter 110 includes scanner locator means comprising two raised circular bosses 110A which are received by corresponding indentations (not shown) formed into the bottom of the optical scanner 112 for positioning the optical scanner 112 on the subplatter 110 for assembly of the data gathering system 100. Of course, differently formed bosses or different locating means can be provided as will be apparent to those skilled in the art.

Preferably, the data gathering system 100 is positioned within the checkout counter 102 such that the upper surface 112A of the optical scanner 112 is slightly above the upper surface 102A of the counter 102. The tapered trim strip 114 is secured across the checkout counter 102 adjacent the entry side 100A of the data gathering system 100 to elevate slightly the upper surface 102A of the counter 102 above the upper surface 112A of the system.

The support means or support cradle 108 is adapted to be hung from the checkout counter 102 by means of support flanges 108A which extend from end plates 108B of the support cradle 108. It should be apparent that the counter 102 can be adapted to support the data gathering system 100 from the support flanges 108A such that the system can be precisely located relative to the counter 102 with convenient adjustment, if necessary, being provided by shims or otherwise. The support cradle 108 comprises at least two subplatter stop members 108C, six stop members 108C being included in the illustrated embodiment as best shown in Figs. 1 and 2, positioned to engage the subplatter 110 at the maximum extent of its travel to thereby prevent potentially damaging overtravel of the load cell scale 104. Preferably, stop pads 108D made of rubber or other resilient material are secured to the upper surfaces of the stop members 108C as shown in Figs. 2-4.

The support cradle 108 comprises generally vertical side walls 118 and a bottom wall 120 which define a channel 122 extending laterally across the checkout counter 102 for receiving and protecting the load cell flexure 106 and electrical circuitry (not shown) which is connected to and operable with one or more load cells 124, see Fig. 1, secured to the load cell flexure 106 in accordance with well known weighing scale technology. The bottom wall 120 is peaked near its center 120A such that it gradually tapers downward toward the end plates 108B of the support cradle 108 adjacent which the bottom wall 120 terminates in open slots 120B. A crowned channel cover 126, shown in Figs. 1-4, includes an opening 126A through which the load cell flexure 106 is connected to the subplatter 110, see Fig. 2.

This support arrangement or mounting for the data gathering system 100 is preferred since it provides improved spill control over the prior art. In particular, any spilled liquids which flow over the entry side 100A or exit side 100B of the system will flow harmlessly down the sides of the optical scanner 112 to the floor beneath the system where it can be periodically or immediately attended to through access panels (not shown) in the counter 102. Spilled liquids which flow down the ends of the system will be limited due to the narrowness of slots 128 between the optical scanner 112 and the support flanges 108A/end plates 108B of

the support cradle 108, see Figs. 2 and 3. Further, the majority of such liquid will also flow harmlessly to the floor beneath the system due to the narrowness of the width of the channel 122 which is approximately one third of the width of the data gathering system 100. The remaining small portion of spilled liquid which passes through the narrow slots 128 will initially engage the crowned channel cover 126 and be diverted to the sides of the channel 122 and once again to the floor beneath the system.

Any spilled liquid which does manage to seep past the channel cover 126 will flow down the interior surfaces of the end plates 108B and/or be diverted by the tapered bottom wall 120 to pass to the floor beneath the system through the slots 120B. Spilled liquids are thus eliminated from the data gathering system 100 by paths which do not tend to interfere with the movement and hence the operation of the scale 104 of the system.

To maintain the accuracy of the scale 104, cables for conducting electrical signals and power between the optical scanner 112 and the scale 104 of the data gathering system 100 are formed and secured to the scale 104 during its manufacture. More particularly, cables 180 are sized such that they extend between and are secured to the subplatter 110 and one of the side walls 118 of the channel 122 such that the cables permit free movement of the scale flexure 106 but do not affect such movement, see Figs. 1-3. By thus sizing the cables 180 such that they do not rest upon a portion of the data gathering system 100 dependent upon the deflection of the load cell flexure 106, the weight of the cables 180 can be compensated by calibration of the scale 104. This cabling arrangement is important since cables to the optical scanner 112 must be routed through the subplatter 110 via an opening 110B therethrough. The cables 180 pass through a corresponding opening 112C, see Fig. 1, in the bottom of the optical scanner 112 and are precisely located and secured therein to assist in stabilizing the accuracy of the scale 104.

Reference is made to Fig. 5 which illustrates schematically, the common interface circuit 200 of the present invention and circuitry associated therewith. The common interface circuit 200 is responsive to both the scale means 104 and the optical scanning means 112 including scanner circuit 202, for providing weight data and coded label data to the cash register system 204, which may be an IBM Model 4683 cash register system, as stated previously. The optical scanning means includes circuit 202 having a bar code decoder circuit 206 for decoding scan signals to provide coded label data. Circuit 202, preferably an NCR VLSI decoder circuit, decodes label segment data received on line 208. Scanner microprocessor 210 correlates the coded label data received from circuit 206 and supplies the coded label data to the common interface circuit 200 under control of control software stored in scanner memory means 212, preferably comprising an EPROM. Scanner microprocessor 210 is preferably an INTEL 8039 microprocessor.

The scale means 104 may supply weight data via line 214 to the bar code decoder circuit 206 of the optical scanning means, and the bar code decoder circuit 206 then supplies this weight data to the common interface circuit 200 via the scanner microprocessor 210 without alteration. As indicated in Fig. 5 by line 214', the scale means 104 may supply weight data directly to the common interface circuit, if desired.

The common interface circuit 200 comprises an interface microprocessor 216, responsive to coded label data from the optical scanning means 112 and to weight data from the scale means 104. Microprocessor 216 is preferably a ZILOG Super8 microprocessor. Circuit 200 also includes an interface memory means 218, preferably an EPROM, for storing control software for use by the interface microprocessor 216. A driver circuit 219 is responsive to the interface microprocessor 216 for supplying weight data and coded label data to the cash register system 204.

The control software stored in scanner memory means 212 may be exemplified by the following listing.

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
                2500 A.D. Super 8 Macro Assembler - Version 4.01e
                -------------------------------------------------

                        Input  Filename : s84683.asm
                        Output Filename : s84683.obj


   1                                    ; Super 8 Software for the IBM 4014 interface.  The .Hex file produced
   2                                    ; is called S84683.HEX.
   3
   4                                    ; Spectra-Physics Part Number 896-0159 Rev A
   5                                    ; Compiled by Blake Issacs
   6                                    ; Date:  3-14-1988
   7
   8                                    ; Interrupt vectors:
   9
  10          0000                      dummy   equ     0
  11
  12  0000    0450 045F 0461                    dw      vec_0,vec_2,vec_4,vec_6
      0006    0463
  13  0008    0465 0442 0467                    dw      vec_8,int_p33,vec_c,vec_e
      000E    0469
  14  0010    0468 0460 046F                    dw      vec_10,vec_12,vec_14,vec_16
      0016    0471
  15  0018    0473 0475 0477                    dw      vec_18,vec_1a,vec_1c,vec_1e
      001E    0479
  16
  17  0020                              start:
  18  0020    9F                              ei              ; Zilog suggestion
  19  0021    8F                              di
  20
  21                                    ; Initialize PORT registers:
  22                                    ; Initialize ports before setting to outputs:
  23
  24  0022    B0 D0                           clr     P0
  25  0024    B0 D2                           clr     P2
  26  0026    B0 D3                           clr     P3
  27  0028    B0 D4                           clr     P4
  28
  29  002A    E6 F8 88                        ld      P2AM,#X88       ; P31 is output (TxD)
  30  002D    E6 F9 62                        ld      P2BM,#X62
  31  0030    E6 FA 09                        ld      P2CM,#X09
  32  0033    E6 FB 80                        ld      P2DM,#X80
  33
  34                                    ;           88  P2AM 10 00 10 00  P31 is TxD output, P30 is RxD input
  35                                    ; Modes             31 30 21 20  P20 and 21 wired together for uart ck
  36                                    ;
  37                                    ;                                P33 is interupt on end of data
  38                                    ;  for      62  P2BM 01 10 00 10  P32 is Data ready to 8039, P22 is low if
  39                                    ;                   33 32 23 22  S8 has data, and P23 is rmi from emulator
  40                                    ; Ports
  41                                    ;           08  P2CM 00 00 10 01
  42                                    ;                   35 34 25 24  HXO on P24/25 conf for fast int?
  43                                    ;
```

```
44                          ;          80  P2DM 10 00 00 00  P37 enables 3695 Tx
45                          ;                 37 36 27 26  P27 is /ack from 8039 when in command
46                          ;                              mode
47
48                          ; 241/0/PM defaults to good stuff.
49
50   0036   E6 F1 30                 id      PM,#X30
51
52                          ; 240/0/PDM default is OK, too.
53
54   0039   E6 F0 FF                 id      PDM,#%ff
55
56                          ; 252 & 253/0/P2xIP defaults OK
57                          ; 246/0/P4D defaults to all inputs, which we want.
58                          ; 247/0/P4OD defaults to totem-pole, which we want.
59
60                          ; 244/0/HDC : Handshake 0 used for Port 4, DMA to regs 0001 1101
61
62   003C   E6 F4 00                 id      HDC,#X0
63
64                          ; 245/0/H1C ...not used
65
66   003F   E6 F0 FF                 id      PDM,#XFF        ; programs rest of P0 as address lines
67   0042   E6 00 00                 id      X0,#X0
68   0045   E6 D8 FF                 id      SPH,#%ff        ; the high part of the stack pointer
69   0048   E6 DD 01                 id      IMR,#X1         ; interupt mask reg, level 0 only
70                                                           ; ok for 23 and 33
71   004B   E6 FF 10                 id      IPR,#X10        ; interupt priority register a>b>c
72                                                           ; (port 23 mode set above as interupt)
73
74                          ; Counters
75
76                          ; 224/0/C0CT and 225/0/C1CT : idle
77                          ; 224/1/C0M and 225/1/C1M : simple timers
78
79   004E   5F                       sb1
80   004F   E6 E0 04                 id      C0M,#4
81   0052   E6 E1 04                 id      C1M,#4
82   0055   4F                       sb0
83
84                          ; initialize interrupt system
85
86                          ; 255/0/IPR : default priorities OK.
87                          ; 222/SYM : Fast interrupts on IRQ4:
88
89   0056   E6 DE 10                 id      SYM,#X10        ;not needed yet, used dma
90
91                          ; 221/IMR : enable IRQ4 for Handshake 0 later...
92
93                          ; 254/0/EMT : defaults to stack in registers
94                          ; ..so put it at top of RAM (in registers)
95
96   0059   B0 FE                    clr     EMT         ; fast memory; stack in registers
97   005B   B0 D8                    clr     SPH
98   005D   E6 D9 FF                 id      SPL,#XFF
99
100                         ; Program the UART:
```

```
101
102                          ; /1/UMA : clock *32 rcv flag = 1  (16 desired by SP)
103                          ; /1/UMB : use system clock xtal/2 to P2,
104  0060  5F                       SB1
105  0061  E6 FE 00                  ld      WUMCN,#X0  ; don't user wake up mask
106  0064  E6 FF 00                  ld      WUMSK,#X0
107  0067  E6 FA 73                  ld      UMA,#X73   ;0111 0011   ; div by 16 for 6 Mhz xtal,
108                                                                   ; no parity, wake up bits are
109                                                                   ; expected high for rec and sent
110                                                                   ; high on xmit.
111  006A  E6 FB 44                  ld      UMB,#X44   ;0100 0100
112  006D  4F                        SB0
113
114                          ; /0/UTC : set up and enable transmitter:
115
116  006E  E6 EB BE                  ld      UTC,#XBE        ; 10111110  12-bit chars, etc.
117                                                          ; use P31 for xmit data, don't send
118                                                          ; break, 2 stop bits, wake up enable!,
119                                                          ; trans enable, zero count (not used),
120                                                          ; TBE, and Trans DMA (off)
121
122                          ; /0/UIE : no interrupts for now
123
124  0071  BD ED                     clr     UIE
125  0073  E6 EC 7C                  ld      URC,#X7C        ; 01111100  reset, but disabled
126
127                          ; When ready to start, ld URC with #2 to enable receiver.
128  0076                            title   IBM 4683 INTERFACE SOFTWARE FOR SUPER8
129
130  0000                            RSECT
131                          ; Output buffer format:
132                          ;    dev_addr/SDLC/stat1/stat2/stat3/message
133                          ; Device addr and status will remain here permanently.
134
135  0000                    out_buff ds      19      ; output buffer, starts at reg loc 0
136  0013                    out_len  ds      1       ;
137  0014                    out_sdlc ds      1       ; 2nd byte of output msg
138  0015                    in_flag  ds      1               ;
139  0016                    in_len   ds      1               ; input length
140  0017                    in_buff  ds      9       ; input buffer
141  0020                    our_stat         ds      1       ; status byte:
142  0021                    RRcntr   ds      1       ; RR_pend timeout counter
143
144        0000              online   equ     0       ; bit 0 = online
145        0001              RR_pend  equ     1       ; bit 1 = RR pending
146        0002              SNRMed   equ     2       ; bit 2 = SNRMed; owe him UA
147
148  0022                    stat_req ds      1       ; 1 = send status on next cycle
149  0023                    EC_req   ds      1       ; 1 = send EC on next cycle
150  0024                    set_RR   ds      1
151
152        0002              Sta_byte1 equ    2       ; offset from 0 for status bytes
153        0003              Sta_byte2 equ    3       ; (adr is 0, 1 is SDLC byte)
154        0004              Sta_byte3 equ    4       ; not used
155
156  0025                    delay1 ds        1
157  0026                    delay2 ds        1
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
158  0027                    sv11    ds    1            ;**********************
159  0051                            org   %51
160  0051                    poll_ct ds    1            ;*     NOTE!
161                                                     ;*  DON'T USE r1
162                                     ends            ;*  (used by DMA)
163                                                     ;**********************
164  0076                            CODE
165
166                          ; Setup low register file:
167
168  0076  1C 50                     ld    r1,#%50
169  0078  D6 C1 00          $lup    ld    @r1,#%00
170  007B  1A FB                     djnz  r1,$lup
171  007D  B0 00                     clr   0
172  007F  0C 05                     ld    r0,#%5
173  0081  B0 C2                     clr   r2
174  0083  C6 CC 04 26               ldw   rr12,#hdr
175  0087  E3 3C             hdlp:   ldci  r3,@rr12     ; load up the above header in low reg space
176  0089  D7 23                     ld    @r2,r3
177  008B  2E                        inc   r2
178  008C  0A F9                     djnz  r0,hdlp
179  008E  46 D3 04                  or    P3,#%04      ; be sure p32 is high (0000 0100)
180
181                          ;ROM checksum routine
182
183  0091  9C 00             chksm0: ld    r9,#0
184  0093  C6 CC 00 00               ldw   rr12,#0
185  0097  E3 8C             chksm1: ldci  r8,@rr12     ; load next byte into reg
186                                                     ; from program memory
187  0099  02 98                     add   r9,r8        ; r9 to hold sum
188  009B  A6 CD 00                  cp    r13,#0       ; Address of last byte in EPROM
189                                                     ; (low address byte)
190  009E  68 02                     jr    eq,chksm2    ; done adding ?
191  00A0  8B F5                     jr    chksm1       ; no, loop back
192  00A2  A6 CC 10          chksm2: cp    r12,#%10     ; Address of last byte in EPROM
193  00A5  EB F0                     jr    ne,chksm1    ; no, loop back
194  00A7  A6 C9 FF                  cp    r9,#%FF      ; is checksum FF ?
195  00AA  68 02                     jr    eq,chksm3    ; yes, jump
196  00AC  8B E3                     jr    chksm0       ; repeat checksum until passed
197                          chksm3:                    ; good checksum
198
199  00AE  56 03 FE                  and   Sta_byte2,#%FE ; set scanner not alive,
200                                                     ; status set to alive only
201                                                     ; after successful handshake
202                                                     ; with 8039
203                          ; END OF INITIALIZTION
204
205  0081                    uart_main:
206
207  0081  46 EC FE                  or    URC,#%FE     ; Rx on
208  0084  EB EF                     ld    r14,UIO      ; trash random input
209  0086  EC 17                     ld    r14,#in_buff ; point to buffer
210  0088  B0 CC                     clr   r12          ; count = 0
211  008A                    poll2
212  008A  08 D2                     ld    r0,p2        ; test 8039 PON line
213  008C  37 0F 00                  btjrt scnr_on,r0,#7 ; is the scanner on?
214  008F  38 03                     ld    r3,Sta_byte2 ; no
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
215  00C1  37 30 15          btjrf   pon_ovr,r3,#0   ; is scanner already marked off?
216  00C4  56 03 FE          and     Sta_byte2,#Xfe  ; no, mark scanner off bit
217  00C7  E6 22 01          ld      stat_req,#X1    ; queue in an unrequested status
218  00CA  88 0D             jr      pon_ovr
219
220  00CC  38 03       scnr_on ld    r3,Sta_byte2
221  00CE  37 31 08            btjrt   pon_ovr,r3,#0   ; jmp, scanner alive bit already set
222  00D1  2C 77               ld      r2,#X77         ; load valid checksum to send to 8039
223  00D3  F6 03 80            call    tell_8039       ; send checksum result to 8039
224                                                    ; successful handshake with 8039 will
225                                                    ; mark scanner alive bit
226  00D6  E6 22 01            ld      stat_req,#X1    ; queue in an unrequested status
227
228                       ; SERVICE 4683
229
230  00D9                 pon_ovr
231  00D9  B8 EC                 ld      R8,URC
232  00DB  37 80 DC              btjrf   poll2,r8,#0     ; loop until RDA
233  00DE
234  00DE  98 EF          poll3  ld      R9,UIO          ; get input
235  00E0  E6 EC FE              ld      URC,#XFE        ; reset UART recvr
236  00E3  37 8E D4              btjrf   poll2,r8,#7     ; loop until MD
237
238  00E6  37 9E 08       poll4  btjrf   addred,r9,#7    ; go if an address
239  00E9  A6 C9 CA              cp      r9,#XCA         ; 1010 1010 4a + 80
240  00EC  EB CC                 jr      ne,poll2        ; not my poll
241  00EE  8D 02 3D              jp      polled          ; ..else, polled
242  00F1                 addred:
243  00F1  A6 C9 4A              cp      r9,#X4A         ; for me?
244  00F4  68 05                 jr      eq,me           ; ..yes
245  00F6  A6 C9 7A              cp      r9,#X7A         ; broadcast?
246  00F9  EB BF                 jr      ne,poll2        ; ..no - try again
247
248                       me:                           ; A message for me!
249  00FB  76 C8 18              tm      R8,#X18         ; any UART errors?
250  00FE  ED 01 74              jp      nz,ERR01        ; ..yes
251
252  0101  C6 CA FF FF           ldw     RR10,#XFFFF     ; init. CRC
253  0105  D7 E9           p_4_a  ld      @r14,R9         ; save input
254  0107  A6 CC 08              cp      r12,#X08        ; limit in_buff to 9 bytes
255  010A  68 02                 jr      z,poll5
256  010C  EE                    inc     r14
257  010D  CE                    inc     r12             ; bump count
258
259  010E  08 EC           poll5  ld      R0,URC
260  0110  37 00 FB              btjrf   poll5,r0,#0     ; loop for RDA
261
262  0113  98 EF           poll6  ld      R9,UIO          ; get input
263  0115  A6 C9 7E              cp      R9,#X7E         ; flag (EOM)?
264  0118  EB 03                 jr      ne,poll7        ; ..no
265  011A  37 0F 06              btjrt   crc0,R0,#7      ; go if 9th bit
266  011D  37 0E E5        poll7 btjrf   p_4_a,R0,#7     ; error if 9th bit and not EOM
267  0120  8D 01 7E              jp      ERR23           ; (needs a long jump)
268
269                       ;========== EOM received ====================
270
271                       ; check CRC's
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
272
273  0123  C9 16          crc0   ld     in_len,r12      ; stash count in buffer
274  0125  C6 CA FF FF            ldw    rr10,#%FFFF     ; init CRC
275  0129  EC 17                   ld     r14,#in_buff
276  0128  C7 9E          crc1   ld     r9,@r14
277  012D  F6 03 F7               call   chksum          ; do CRC check on byte
278  0130  EE                     inc    r14             ; set to next byte
279  0131  CA F8                  djnz   r12,crc1        ; length of message in r12
280
281  0133  A6 CA B8               cp     r10,#%B8
282  0136  EB 41                  jr     ne,ERR20
283  0138  A6 CB F0               cp     r11,#%F0
284  013B  EB 3C                  jr     ne,ERR20        ; bad CRC
285  013D
286                        ; check SDLC counts...
287
288  013D  88 18                  ld     R8,in_buff+1
289  013F  76 C8 11               tm     r8,#%11         ; is it RRROSSSO ?
290  0142  68 0C                  jr     z,poll9         ; ..yes - msg
291  0144  98 C8                  ld     r9,r8
292  0146  56 C9 1F               and    r9,#%1F
293  0149  A6 C9 01               cp     r9,#%01
294  014C  68 08                  jr     eq,poll10       ; RR
295  014E  88 1F                  jr     poll11          ; other SDLC protocol bytes
296  0150                 poll9:
297  0150  56 C8 0E               and    r8,#%0E
298  0153  D0 C8                  sra    r8
299  0155  A2 85                  cp     r8,r5           ; vs my rrr
300  0157  EB 2A                  jr     ne,ERR24
301  0159  88 18          poll10  ld     r8,in_buff+1
302  015B  F0 C8                  swap   r8
303  015D  56 C8 0E               and    r8,#%0E
304  0160  D0 C8                  sra    r8
305  0162  A2 84                  cp     r8,r4           ; vs my sss
306  0164  EB 22                  jr     ne,ERR25
307  0166  88 18                  ld     r8,in_buff+1    ; one more time
308  0168  37 81 04               btjrt  poll11,r8,#0    ; go if protocol
309  016B  5E                     inc    r5              ; bump my RRR
310  016C  56 C5 07               and    r5,#7           ; RRR is 3 bits
311
312                        poll11:              ; Have a good input message...
313
314  016F  E6 15 FF               ld     in_flag,#%FF    ; flag = good msg
315  0172  8B 19                  jr     T0126           ; exit
316
317  0174  E6 15 01        ERR01   ld     in_flag,#%01    ; UART error
318  0177  8B 14                  jr     T0126
319
320  0179  E6 15 20        ERR20   ld     in_flag,#%20    ; CRC error
321  017C  8B 0F                  jr     T0126
322
323  017E  E6 15 23        ERR23   ld     in_flag,#%23    ; improper 9th bit
324  0181  8B 0A                  jr     T0126
325
326  0183  E6 15 24        ERR24   ld     in_flag,#%24    ; his S <> my R
327  0186  8B 05                  jr     T0126
328
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
329  0188  E6 15 25      ERR25  ld     in_flag,#%25    ; his R <> my S
330  0188  8B 00                  jr     T0126
331
332                       ; Common exit from this routine...
333
334  018D  56 EC FD      T0126  and    URC,#%FF-%02    ; stop UART receiver
335
336                       ;  At this point, we have either:
337                       ;       An error
338                       ;       An input message
339                       ;       A SNRM
340                       ;       An RR
341                       ;
342                       ;  If we are offline, only a SNRM is acceptable; we should send
343                       ;  NSA, reset our counts, and mark ourselves on-line.
344
345  0190  38 20                   ld     r3,our_stat     ; get our status
346                                                      ; (used throughout below code)
347
348  0192  A6 15 FF              cp     in_flag,#%FF    ; did we get a message?
349  0195  ED 00 B1              jp     ne,uart_main    ; ..nope
350  0198  A6 18 83              cp     in_buff+1,#%83  ; is it SNRM?
351  019B  EB 17                 jr     ne,no_SNRM      ; ..no
352
353  019D  3C 32                 ld     r3,#50          ; initialize RR timeout counter
354  019F  39 21                 ld     RRcntr,r3
355  01A1  3C 00                 ld     r3,#%0          ; clear the world on a SNRM
356  01A3  F6 04 28              call   mk_ready        ; could remove this part from main
357  01A6  9F                    ei                     ; where it leads into the uart call
358
359  01A7  77 35                 bits   r3,#SNRMed      ; ..yes - mark it
360  01A9  77 31                 bits   r3,#online      ; ..and put us online
361  01AB  39 20                 ld     our_stat,r3     ; save stat
362
363  01AD  B0 C4                 clr    r4              ; clear msg counts
364  01AF  B0 C5                 clr    r5              ; ...
365
366  01B1  8D 00 B1              jp     uart_main       ; and exit
367
368
369                       ;  If we just sent a message, then we only expect an RR.
370  01B4  37 32 15      no_SNRM btjrf  no_RR,r3,#RR_pend      ; go if no RR reqd
371  01B7  28 18                 ld     r2,in_buff+1    ; get SDLC byte
372  01B9  56 C2 1F              and    r2,#%1F         ; should be RRR00001
373  01BC  A6 C2 01              cp     r2,#1
374  01BF  EB 08                 jr     ne,no_RR        ; ..but it isnt
375  01C1  77 32                 bitr   r3,#RR_pend     ; reset RR pending bit
376  01C3  39 20                 ld     our_stat,r3     ; save status
377  01C5  F6 04 28              call   mk_ready        ; scans from the 8039
378  01C8  9F                    ei
379  01C9  8D 00 B1              jp     uart_main       ; and exit
380
381  01CC  37 31 03      no_RR  btjrt  we_is_on,r3,#online     ; go if online
382  01CF  8D 00 B1              jp     uart_main       ; ERROR - no valid msgs here
383
384  01D2                we_is_on:
385  01D2  28 18                 ld     r2,in_buff+1    ; get SDLC byte
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
386  01D4  56 C2 11          and   r2,#X11        ; should be RRR0SSS0
387  01D7  ED 00 81          jp    nz,uart_main   ; ..but it isnt
388
389                    ;  Got a good message...process it
390
391  01DA  E6 24 01          ld    set_RR,#X1     ; flag that next poll gets RR
392
393  01DD  28 19             ld    r2,in_buff+2   ; get command byte
394  01DF  A6 C2 00          cp    r2,#X00
395  01E2  68 39             jr    z,sys_cmd      ; go if system command
396
397  01E4  A6 C2 11          cp    r2,#X11        ; enable command
398  01E7  EB 09             jr    ne,cmd1
399  01E9  46 03 02          or    Sta_byte2,#X2  ; 0000 0010
400  01EC  F6 03 80          call  tell_8039
401  01EF  8D 00 81          jp    uart_main
402
403  01F2  A6 C2 12    cmd1  cp    r2,#X12
404  01F5  EB 09             jr    ne,cmd2        ; disable
405  01F7  56 03 FD          and   Sta_byte2,#Xfd ; 1111 1101
406  01FA  F6 03 80          call  tell_8039
407  01FD  8D 00 81          jp    uart_main
408
409  0200  A6 C2 14    cmd2  cp    r2,#X14
410  0203  EB 09             jr    ne,cmd3        ; beep enable
411  0205  46 02 10          or    Sta_byte1,#X10 ; 0001 0000
412  0208  F6 03 80          call  tell_8039
413  0208  8D 00 81          jp    uart_main
414
415  020E  A6 C2 18    cmd3  cp    r2,#X18
416  0211  ED 00 81          jp    ne,uart_main   ; disable-beep
417  0214  56 02 EF          and   Sta_byte1,#Xef ; 1110 1111
418  0217  F6 03 80          call  tell_8039
419  021A  8D 00 81          jp    uart_main
420
421  021D  28 1A       sys_cmd ld    r2,in_buff+3   ; get system command
422
423  021F  37 28 0F            btjrt   stat_set,r2,#5 ; status req
424  0222  37 2F 12            btjrt   EC_set,r2,#7   ; EC# req
425  0225  37 29 09            btjrt   stat_set,r2,#4 ; test req = status req
426  0228  37 2D 03            btjrt   sys_reset,r2,#6 ; system reset
427
428  022B  8D 00 81            jp      uart_main      ; bad system command
429
430  022E              sys_reset:
431  022E  8D 00 20            jp      %0020          ; restart program!
432
433  0231              stat_set:
434  0231  E6 22 01            ld      stat_req,#X1   ; send status on next poll
435  0234  8D 00 81            jp      uart_main
436
437  0237              EC_set:
438  0237  E6 23 01            ld      EC_req,#X1     ; send EC on next poll cycle
439  023A  8D 00 81            jp      uart_main
440
441                    ; We got 1st poll character...look for 2nd
442
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
443  0250  88 EC        polled  ld      R8,URC
444  0252  37 80 FB                btjrf   polled,R8,#0          ; loop until RDA
445  0255  98 EF                   ld      r9,UIO          ; get input
446  0257  E6 EC FF                ld      URC,#%FF        ; clear status
447  025A  A6 C9 CA                cp      r9,#%CA
448  025D  68 03                   jr      eq,poll_4me

450  025F  8D 00 BA                jp      poll2           ; else, ignore

452  0262                  poll_4me:

                           ;  If offline, we will always send ROL.
                           ;  If SNRMd, we will send NSA.
                           ;  If out_len <> 0, send message from out_buff.
                           ;  If out_len = 0, simply send EOP.

459  0262                  ok:
460  0262  38 20                   ld      r3,our_stat
461  0264  37 31 06                btjrt   p_4a,r3,#online ; go if on_line
462  0267  F6 03 C7                call    SEND_ROL        ; send ROL
463  026A  8D 00 B1                jp      uart_main       ; ..and exit

465  026D  37 34 00        p_4a    btjrf   p_4b,r3,#SNRMed ; go if not SNRMed
466  0270  F6 03 CC                call    SEND_NSA        ; if SNRM, send NSA
467  0273  77 34                   bitr    r3,#SNRMed      ; reset request for NSA
468  0275  39 20                   ld      our_stat,r3     ; ..in rsect
469  0277  E6 22 01                ld      stat_req,#%1    ; queue an unrequested status
470  027A  8D 00 B1                jp      uart_main       ; ..and exit
471  027D                  p_4b:
472  027D  A6 24 00                cp      set_RR,#%0      ; check if RR is needed
473  0280  60 02 79                jp      z,p_4bb
474  0283  E6 24 00                ld      set_RR,#%0      ; clear flag
475  0286  F6 03 B1                call    SEND_RR
476  0289  8D 00 B1                jp      uart_main
477
478  028C  A6 22 00        p_4bb:  cp      stat_req,#%0    ; see if we need to send status
479  028F  68 16                   jr      z,p_4c          ; skip if no request for status
480  0291  E6 01 00                ld      out_buff+1,#%0  ; need to wipe the SDLC byte
481  0294  EC 00                   ld      r14,#%0         ; msg pointer
482  0296  CC 05                   ld      r12,#%5         ; length = 5
483  0298  E6 22 00                ld      stat_req,#%0    ; clear status request
484  029B  F6 02 F8                call    MSG_OUT
485  029E  38 20                   ld      r3,our_stat
486  02A0  77 33                   bits    r3,#RR_pend     ; mark RR pending
487  02A2  39 20                   ld      our_stat,r3
488  02A4  8D 00 B1                jp      uart_main
489
490  02A7                  p_4c:
491  02A7  A6 23 00                cp      EC_req,#%0      ; see if an EC req has been queued
492  02AA  68 1F                   jr      z,p_4d          ; again skip if no EC request
493  02AC  E6 01 00                ld      out_buff+1,#%0  ; must wipe SDLC byte or MSG_OUT fails
494  02AF  46 02 01                or      out_buff+2,#%01 ; flag that EC present
495  02B2  E6 05 04                ld      out_buff+5,#%04 ; the observed EC #
496  02B5  EC 00                   ld      r14,#out_buff   ; EC might overlay first char in msg
497  02B7  CC 06                   ld      r12,#%6         ; length =6
498  02B9  E6 23 00                ld      EC_req,#%0      ; clear EC request
499  02BC  F6 02 F8                call    MSG_OUT
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
500  02AC  56 02 FE          and   out_buff+2,#%fe ; clear EC present from status
501  02AF  38 20              ld    r3,our_stat
502  02B1  77 33              bits  r3,#RR_pend    ; mark RR pending
503  02B3  39 20              ld    our_stat,r3
504  02B5  80 00 B1           jp    uart_main
505
506  02B8  A6 13 00     p_4d: cp    out_len,#0     ; last check for msgs to go
507  02BB  EB 06              jr    nc,p_4e        ; there is a msg to go
508  02BD  F6 03 D1           call  SEND_EOP       ; else, send EOP
509  02C0  80 00 B1           jp    uart_main
510
511                     ; may have already sent msg and could be awaiting RR
512
513  02C3               p_4e:
514  02C3  38 20              ld    r3,our_stat
515  02C5  37 32 16           btjrf p_4f,r3,#RR_pend ; test to keep msg from dup xmits
516  02C8  70 C9              push  r9
517  02CA  98 21              ld    r9,RRcntr      ; RR timeout counter
518  02CC  00 C9              dec   r9
519  02CE  A6 C9 00           cp    r9,#0
520  02D1  EB 02              jr    nz,p_4ee       ; if RR timeout, mark ourselves
521  02D3  77 30              bitr  r3,#online     ; offline
522  02D5  99 21        p_4ee: ld    RRcntr,r9
523  02D7  50 C9              pop   r9
524  02D9  39 20              ld    our_stat,r3
525  02DB  80 00 B1           jp    uart_main
526
527  02DE  CC 32        p_4f: ld    r12,#50        ; reset RR timeout counter
528  02E0  C9 21              ld    RRcntr,r12     ; get ready to send label
529  02E2  C8 13              ld    r12,out_len    ; get length
530  02E4  EC 00              ld    r14,#out_buff  ; ..and address
531  02E6  EE                 inc   r14            ; point to SDLC byte
532  02E7  06 CE 00           ld    @r14,#0        ; clear byte (see MSG_OUT for why)
533  02EA  00 CE              dec   r14            ; point back to start
534  02EC  F6 02 F8           call  MSG_OUT        ; send msg
535  02EF  38 20              ld    r3,our_stat
536  02F1  77 33              bits  r3,#RR_pend    ; mark RR pending
537  02F3  39 20              ld    our_stat,r3
538  02F5  80 00 B1           jp    uart_main      ; exit
539
540                     ;  Message output... assumes register usage:
541                     ;       R14 = address of msg to send (RSECT)
542                     ;       R12 = length of message (max. 20 )
543                     ;       RR10 : will be used for checksums
544                     ;       R9   : will carry one byte for output
545                     ;       R8   : will carry flags for output
546                     ;       RR4  : SDLC counts
547  02F8               MSG_OUT:
548  02F8  56 EC FD           and   URC,#%FF-%02   ; receiver off
549  02FB  46 D3 80           or    P3,#%80        ; P37 on (3695 xmitter)
550  02FE  0C 0C              ld    R0,#12         ;                          10
551  0300  0A FE        llll  djnz  R0,llll        ; delay for awhile         12/n
552  0302  5F                 sb1                  ;                          6
553  0303  46 FA 01           or    UMA,#%01       ; 9th bit high (1 state)   10
554  0306  4F                 sb0                  ;                          6
555  0307  C7 9E              ld    R9,@R14        ; get 1st byte             10
556  0309  EE                 inc   R14            ;                          6
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
557  030A  99 EF          ld    U10,R9          ; --send it              10
558                                              ;          need 380-388 for address
559  030C  C6 CA FF FF     ldw   RR10,#XFFFF     ; init. CRC              12
560  0310  F6 03 F7        call  chksum          ; 18+166
561
562                  ; set SDLC counts:
563  0313  C7 8E           ld    R8,@R14         ; get byte               6
564  0315  76 C8 11        tm    R8,#X11         ; normal msg?            10
565  0318  EB 0C           jr    nz,NOX          ; --no - protocol        12
566
567  031A  88 C5           ld    R8,r5           ; SDLC rrr               6
568  031C  F0 C8           swap  r8              ;                        6
569  031E  42 84           or    R8,r4           ; SDLC sss               6
570  0320  90 C8           rl    r8              ;                        6
571  0322  D7 E8           ld    @R14,R8         ; stuff counts           6
572  0324  8B 07           jr    M_O_O           ;                        12
573
574  0326  FF        NOX   nop
575  0327  FF              nop
576  0328  FF              nop
577  0329  FF              nop
578  032A  FF              nop
579  032B  8B 00           jr    M_O_O           ;                        12
580
581  032D  B9 14     M_O_O: ld   out_sdlc,R8     ; remember it            10
582  032F  5F               sbl                  ;                        6
583  0330  56 FA FE         and   UHA,#XFF-X01   ; 9th bit 0 state        10
584  0333  4F               sb0                  ;                        6
585  0334  00 CC     M_O_1  dec   R12            ;                        6
586  0336  6B 0A            jr    z,M_O_2        ; go if no more data     10
587  0338  C7 9E            ld    R9,@R14        ; get byte               6
588  033A  EE               inc   R14            ;                        6
589
590  033B  99 EF            ld    U10,R9         ;  (192 2nd) total 384   10
591
592  033D  F6 03 F7         call  chksum         ;                        12+166
593  0340  8B F2            jr    M_O_1          ;                        12
594
595  0342  98 CA     M_O_2 ld    R9,R10         ; get 1st chksum         6
596  0344  B9 27           ld    sv11,R11       ; --save 2nd             6
597  0346  60 C9           com   R9             ; compl. 1st one         6
598  0348  99 EF           ld    U10,R9         ; --send it   (close)    10
599
600  034A  F6 03 F7         call  chksum         ; --and add to CRC       178
601  034D  98 27           ld    R9,sv11        ; get original 2nd CRC   6
602  034F  60 C9           com   R9             ;                        6
603  0351  99 EF           ld    U10,R9         ; send it   total?       10
604
605  0353  F6 03 F7         call  chksum         ;                        178
606  0356  9C 7E           ld    R9,#X7E        ; load flag byte         10
607  0358  5F               sbl                  ;                        6
608  0359  46 FA 01         or    UHA,#X01       ; 9th bit 1 state        10
609  035C  4F               sb0                  ;                        6
610  035D  0C 0F           ld    r0,#15         ;                        10
611  035F  0A FE     NOXS  djnz  r0,NOXS        ;                        152
612  0361  99 EF           ld    U10,R9         ; xmit                   10
613
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
614  0363  9C 15          ld    r9,#21
615  0365  9A FE    M_O_3e  djnz  r9,M_O_3e
616
617  0367  56 D3 7F        and   P3,#%7F          ; 3695 Tx off
618  036A  B8 EF           ld    r8,U10
619  036C  46 EC FE        or    URC,#%FE         ; UART Rx on
620  036F  5F              sb1
621  0370  56 FA FE        and   UMA,#%FF-%01     ; 9th bit 0 state
622  0373  4F              sb0                    ;
623  0374  B8 14           ld    R8,out_sdlc      ; get SDLC byte
624  0376  76 E8 11        tm    R8,#%11          ; was it protocol?
625  0379  EB 04           jr    nz,M_O_4         ; ..yes
626  037B  4E              inc   r4               ; inc sss
627  037C  56 C4 07        and   r4,#7            ; sss is 3 bits
628  037F  AF        M_O_4 ret                    ; exit routine
629
630                    tell_8039:                ; RR will go out on next poll,
631  0380  E6 22 01        ld    stat_req,#%1     ; send status on poll after that
632        8000        ls374   equ   %8000        ; anything beyond rom will do
633  0383  87 21 00 80        lde   ls374,r2     ; stuff command byte into buffer chip
634  0387  C6 C6 00 64        ldw   rr6,#100     ; adjustable timeout for 8039 to respond
635  0388  56 D3 FB        and   P3,#%FB         ; bit 2 on port 3 (P27 on 8039)
636  038E  80 C6      $loc:  decw  rr6
637  0390  68 1E           jr    z,give_up
638  0392  08 D2           ld    r0,P2            ;          sample
639  0394  56 C0 08        and   r0,#%08          ; 0000 1000
640  0397  A6 C0 00        cp    r0,#%0           ; P12 will go low and stay that way
641  039A  EB F2           jr    nz,$loc          ; indicating data has been read.
642                                               ;          When found low,
643  039C  46 03 04        or    P3,#%04          ; 0000 0100  raise line to 8039
644
645  039F  80 C6      $loc2  decw  rr6
646  03A1  68 0D           jr    z,give_up        ; and wait until
647  03A3  08 D2           ld    r0,P2            ; p23 (P12 on 8039)
648  03A5  56 C0 08        and   r0,#%08          ; comes back up.  High state indicates
649  03A8  A6 C0 00        cp    r0,#%0           ; the 8039 is ready to take another cmd
650  03AB  68 F2           jr    z,$loc2
651  03AD  46 03 01        or    Sta_byte2,#%01   ; successful communication to 8039 so
652                                               ; mark scanner alive bit
653
654                    give_up:                   ; time out
655  03B0  AF              ret
656
657                    ; ============ Send Receive-Ready ============
658  03B1              SEND_RR:
659  03B1  88 C5           ld    r8,r5            ; my RRR
660  03B3  F0 C8           swap  r8
661  03B5  90 C8           rl    r8
662  03B7  46 C8 01        or    r8,#1
663  03BA  89 01           ld    out_buff+1,r8
664  03BC              common_short:
665  03BC  E6 00 4A        ld    out_buff,#%4A          ; my addr
666  03BF  EC 00           ld    r14,#out_buff    ; point to buffer
667  03C1  CC 02           ld    r12,#2           ; count = 2
668  03C3  F6 02 F8        call  MSG_OUT
669  03C6  AF              ret
670
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
671
672  03C7
673  03C7   E6 01 0F          ; ========= Send ROL ================
674  03CA   88 F0             SEND_ROL:
675                                   ld      out_buff+1,#%0F         ; ROL
676                                   jr      common_short
677  03CC
678  03CC   E6 01 63          ;========= Send NSA ================
679  03CF   88 EB             SEND_NSA:
680                                   ld      out_buff+1,#%63         ; NSA
681                                   jr      common_short
682  03D1
683  03D1   56 EC FD          ;========= Send EOP ================
684  03D4   46 D3 80          SEND_EOP:
685  03D7   0C 0E                      and     URC,#%FF-%02    ; receiver off
686  03D9   0A FE                      or      P3,#%80         ; P37 on (3695 xmitter) 195 to xmit
687  03DB   FF                         ld      R0,#14          ; NOT hex #                10 cyc
688  03DC   5F                lll7     djnz    R0,lll7         ; delay for awhile    n*10 (12 last)
689  03DD   46 FA 01                   nop                     ;                          6
690  03E0   4F                         sb1                     ;                          6
691                                   or      UMA,#%01        ; 9th bit 1 state          10
692  03E1   E6 EF 5A                   sb0                     ;                          6
693
694  03E4   DC 11                      ld      U10,#%5A        ; send EOP                 10 total  192
695  03E6
696  03E6   0A FE                      ld      r0,#17          ; need 195 cycles            10
697  03E8   FF                $loc_del:
698  03E9   56 D3 7F                  djnz    r0,$loc_del     ;                          n*12
699  03EC   88 EF                      nop                     ;
700  03EE   46 EC FE                   and     P3,#%7F         ; 3695 Tx off   total 198   10
701  03F1   5F                         ld      r8,U10          ; trash input?
702  03F2   56 FA FE                   or      URC,#%FE        ; UART Rx on
703  03F5   4F                         sb1
704  03F6   AF                         and     UMA,#%FF-%01    ; 9th bit 0 state
705                                   sb0                     ; 12/24/86
706                                   ret
707
708
709
710  03F7   70 C3             ;
711  03F9   B2 9A             ; ===== Checksum routine ==================
712  03FB   08 C9             ;  Uses RR10 for chksums.
713  03FD   F0 C9             ;  Current byte in R9.
714  03FF   56 C9 F0          chksum: push    r3              ; 10
715  0402   B2 90                     xor     R9,R10          ; 6
716  0404   38 C9                     ld      R0,R9           ; 6
717  0406   F0 C9                     swap    R9              ; 8
718  0408   56 C9 0F                  and     R9,#%F0         ; 10
719  040B   B2 98                     xor     R9,R0.          ; 6
720  040D   A8 C9                     ld      R3,R9           ; 6
721  040F   98 C3                     swap    R9              ; 6
722  0411   B8 C9                     and     R9,#%0F         ; 10
723  0413   F0 C9                     xor     R9,R11          ; 6
724  0415   E0 C9                     ld      R10,R9          ; 6
725  0417   08 C9                     ld      R9,R3           ; 6
726  0419   56 C0 07                  ld      R11,R9          ; 6
727  041C   56 C9 F8                  swap    R9              ; 6
                                      rr      R9              ; 6
                                      ld      R0,R9           ; 6
                                      and     R0,#%07         ;10
                                      and     R9,#%F8         ;10
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
728  041F  82 A9              xor   R10,R9          ; 6
729  0421  82 B0              xor   R11,R0          ; 3
730  0423  50 C3              pop   r3              ; 10
731  0425  AF                 ret                   ; 14
732
733  0426  4A 00 10 01 00 hdr: db    %4a,%00,%10,%01,%00
734
735                                                 ; device address, SDLC byte,
736                                                 ; and default status bytes (enabled)
737  0428                 mk_ready:
738  0428  46 D2 20           or    P2,#%20         ; be sure P25 is high state
739                                                 ; 0010 0000
740  042E  46 D3 04           or    P3,#%04         ; also p32 high (0000 0100)
741
742  0431  5F                 sb1
743  0432  E6 F0 00           ld    DCH,#%0         ; DMA high byte
744  0435  E6 F1 20           ld    DCL,#%20        ; DMA low byte, will int when zero
745  0438  4F                 sb0
746
747  0439  1C 05              ld    r1,#25          ; used to point into register file, by DMA
748                                                 ; on int will hold msg length ->out_len
749  043B  E6 13 00           ld    out_len,#%0     ; clear semephore to communication side
750  043E  E6 F4 1D           ld    MOC,#%1d        ; load/reload for handshake operation.
751                                                 ; note-do not split this command!
752  0441  AF                 ret
753
754                      int_p33:                   ; hdw derived from msb on last byte
755  0442  4F                 sb0                   ; set register bank pointer
756  0443  E6 D6 C0           ld    RP0,#%C0        ; note, r1 will contain # of char+1
757  0446  E6 F4 00           ld    MOC,#%0         ; turn off handshake and set T0 low
758  0449  56 D2 DF           and   P2,#%df         ; 1101 1111  P25 = T0
759  044C  E6 FC FF           ld    P2AIP,#%ff      ; reset int pending reg (see 8.7.4)
760                                                 ; in super8 book
761
762                      ; Have EOT.  r1 is size of output msg. (buff must be > 0)
763                      ; semaphore to the
764                      ; UART code via out_len.  (EOT not part of msg)
765
766  044F  00 C1              dec   r1              ; compensates for EOT byte
767  0451  19 13              ld    out_len,r1      ; semaphore to UART code (out_len ne 0)
768                                                 ; uart code will find this set and
769                                                 ; xmit
770  0453  BF                 iret
771
772                      ;CODE CHECKSUM
773  0454  CD                 DB    CDH
774                      ;DATE
775  0455  03 23 88           DB    03H,23H,88H
776                      ;PART NUMBER
777  0458  52 96 01 3B        DB    'R',96H,01,59
778                      ;REV
779  045C  41                 DB    'A'
780
781  0450                 vec_0
782  0450  6C 00              ld    r6,#%0
783  045F                 vec_2
784  045F  6C 02              ld    r6,#%2
```

IBM 4683 INTERFACE SOFTWARE FOR SUPER8

```
785  0461
786  0461  6C 04          vec_4
787  0463                        ld      r6,#X4
788  0463  6C 06          vec_6
789  0465                        ld      r6,#X6
790  0465  6C 08          vec_8
791  0467                        ld      r6,#X8
792  0467  6C 0C          vec_c
793  0469                        ld      r6,#XC
794  0469  6C 0E          vec_e
795  0468                        ld      r6,#XE
796  0468  6C 10          vec_10
797  046D                        ld      r6,#X10
798  046D  6C 12          vec_12
799  046F                        ld      r6,#X12
800  046F  6C 14          vec_14
801  0471                        ld      r6,#X14
802  0471  6C 16          vec_16
803  0473                        ld      r6,#X16
804  0473  6C 18          vec_18
805  0475                        ld      r6,#X18
806  0475  6C 1A          vec_1a
807  0477                        ld      r6,#X1a
808  0477  6C 1C          vec_1c
809  0479                        ld      r6,#X1c
810  0479  6C 1E          vec_1e
811  047B  7C FF                 ld      r6,#X1e
812  047D  79 FC                 ld      r7,#Xff
813  047F  79 FD                 ld      P2AIP,r7    ; to clear int pending reg.
814  0481  8F                    ld      P2BIP,r7
815                              iret
816
817  0482                        ends
817  0482                        end
                                 end
```

Defined	Symbol Name	Value	References
Pre	CODE	0000	162 164 816
Pre	DATA	0000	
149	EC_req	0023	438 491 498
437	EC_set	0237	424
317	ERR01	0174	250
320	ERR20	0179	282 284
323	ERR23	017E	267
326	ERR24	0183	300
329	ERR25	0188	306
574	MOX	0326	565
611	MOXS	035F	611
547	MSG_OUT	02F8	484 499 534 668
581	M_O_0	032D	572 579
585	M_O_1	0334	593
595	M_O_2	0342	586
615	M_O_3a	0365	615
628	M_O_4	037F	625
145	RR_pend	= 0001	370 375 486 502 515 536
142	RRcntr	0021	354 517 522 528
Pre	RSECT	0000	130 159
682	SEND_EOP	0301	508
677	SEND_RSA	03CC	466
672	SEND_ROL	03C7	462
658	SEND_RR	0381	475
146	SRRMed	= 0002	359 465 467
152	Sta_byte1	= 0002	411 417
153	Sta_byte2	= 0003	199 214 216 220 399 405 651
154	Sta_byte3	= 0004	
334	T0126	0180	315 318 321 324 327 330
242	addred	00F1	238
183	chksm0	0091	196
185	chksm1	0097	191 193
192	chksm2	00A2	190
197	chksm3	00AE	195
710	chksum	03F7	277 560 592 600 605
403	cmd1	01F2	398
409	cmd2	0200	404
415	cmd3	020E	410
664	common_short	038C	674 679
273	crc0	0123	265
276	crc1	0128	279
156	delay1	0025	
157	delay2	0026	
10	dummy	= 0000	
654	give_up	0380	637 646
175	hdlp	0087	178
733	hdr	0426	174
140	in_buff	0017	209 275 288 301 307 350 371 385 393 421
138	in_flag	0015	314 317 320 323 326 329 348
139	in_len	0016	273
754	int_p33	0442	13
551	lll1	0300	551
686	lll7	0309	686
632	ls374	= 8000	633
248	me	00F8	244
737	mk_ready	0428	356 377

Defined	Symbol Name	Value	References
381	no_RR	01CC	370 374
370	no_SNRM	0184	351
459	ok	024F	
144	online	* 0000	360 381 461 521
141	our_stat	0020	345 361 376 460 468 485 487 501 503 514 524 535 537
135	out_buff	0000	480 493 494 495 496 500 530 663 665 666 673 678
136	out_len	0013	506 529 749 767
137	out_sdlc	0014	581 623
253	p_4_a	0105	266
465	p_4a	025A	461
471	p_4b	026A	465
478	p_4bb	0279	473
490	p_4c	0294	479
506	p_4d	0288	492
513	p_4e	02C3	507
522	p_4ee	02D5	520
527	p_4f	02DE	515
301	poll10	0159	294
312	poll11	016F	295 308
211	poll2	008A	232 236 240 246 450
234	poll3	00DE	
238	poll4	00E6	
259	poll5	01DE	255 260
262	poll6	0113	
266	poll7	011D	264
296	poll9	0150	290
452	poll_4me	024F	448
160	poll_et	0051	
443	polled	0230	241 444
230	pon_ovr	0009	215 218 221
220	scnr_on	00CC	213
150	set_RR	0024	391 472 474
17	start	0020	
148	stat_req	0022	217 226 434 469 478 483 631
433	stat_set	0231	423 425
158	sv11	0027	596 601
421	sys_cmd	021D	395
430	sys_reset	022E	426
630	tell_8039	0380	223 400 406 412 418
205	uart_main	0081	349 366 379 382 387 401 407 413 416 419 428 435 439 463 470 476 488 504 509 525 538
781	vec_0	0450	12
795	vec_10	0468	14
797	vec_12	0460	14
799	vec_14	046F	14
801	vec_16	0471	14
803	vec_18	0473	15
805	vec_1a	0475	15
807	vec_1c	0477	15
809	vec_1e	0479	15
783	vec_2	045F	12
785	vec_4	0461	12
787	vec_6	0463	12
789	vec_8	0465	13
791	vec_c	0467	13

```
Defined          Symbol Name                Value          References

  793    vec_e                              0469          13
  384    wc_is_cn                           0102          381


          Lines Assembled :  817          Assembly Errors :  0
```

The control software stored in interface memory means 218 may be exemplified by the following listing.

```
ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2          PAGE    1
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

                    1 ;*****************************************************************
                    2 ;  FILE:  GMA095.SRC  04-16-87        DREW TAUSSIG
                    3 ;
                    4 ;  FIRMWARE FOR THE 750SL SCANNER
                    5 ;  WILL READ UPC-A,E AND EAN/JANS,13
                    6 ;  IBM-4683 SERIAL I/O CHANNEL, I/F OPTION #95.
                    7 ;
                    8 ;  S-P PART NUMBER R96-0153
                    9 ;
                   10 ;*****************************************************************
                   11 $       INCLUDE(:F1:HISTRY.SRC)
                  12 ;*****************************************************************
                  13 ;  FILE:  HISTRY.SRC  01-23-87 11:50  BOB ACTIS
                  14 ;
                  15 ;  IVRD53 - 750F IG DEMO, SP-OC, VERSION D3 W/ 2ND CHECK     MAY 1983
                  16 ;
                  17 ;  FVRD53 - 750F FT DEMO, SP-OC, VERSION D3 W/ 2ND CHECK     OCT 1983
                  18 ;
                  19 ;  GMA053 - 750SL, SP-OC/NCR-OCIA, READS ALL UPC,EAN & JAN   JUN 1986
                  20 ;
                  21 ;  GMA069 - 750SL, SWEDA PARALLEL/OMRON, READS ONLY A,E,8,13 OCT 1986
                  22 ;
                  23 ;  GMA066 - 750SL, IBM-OCR/FUJITSU                           OCT 1986
                  24 ;                   IBM-OCR READS ONLY A,E,8,13
                  25 ;                   FUJITSU WILL ALSO READ VERSION D
                  26 ;
                  27 ;  IFTP95 - 750F, IBM4683 SERIAL I/O CHANNEL, ONLY A,E,8,13  APR 1987
                  28 ;
                  29 ;*****************************************************************
                   30 $       INCLUDE(:F1:FTDEFS.SRC)
                  31 ;*****************************************************************
                  32 ;  FILE:  FTDEFS.SRC  12-09-86 13:50  BOB ACTIS
                  33 ;
                  34 ;  *** SYSTEM DEFINITION ***
                  35 ;
                  36 ;  PORT 1 DEFINITION:
                  37 ;
0001              38 ETEST   EQU     00000001B       ;P10-O-ENABLE TEST MODE
                  39                                 ;P10-O-I/F RESET
0002              40 ETMARK  EQU     00000010B       ;P11-O-TEST MARK
0002              41 ENTREB  EQU     00000010B       ;P11-O-ENABLE MOTOR
0004              42 EP12    EQU     00000100B       ;P12-O-HANDSHAKE FOR SUPER-8 TO 8039 I/F
0008              43 EP13    EQU     00001000B       ;P13-I-MODE CONTROL FOR S8-8039 I/F
0010              44 ELASDB  EQU     00010000B       ;P14-O-DISABLE LASER
0020              45 EGDLT   EQU     00100000B       ;P15-O-ENABLE GOOD LIGHT
0040              46 EBDLT   EQU     01000000B       ;P16-O-ENABLE BAD LIGHT
0080              47 ETONE   EQU     10000000B       ;P17-O-TONE BIT (AC COUPLED)
                  48 ;
                  49 ;  PORT 2 DEFINITION:
                  50 ;
                  51 ;       EQU     00001111B       ;P20-P23 EXTERNAL PROGRAM ADDRESS LINES
0010              52 ESENT   EQU     00010000B       ;P24-I-VLSI DATA SENT* (USED ONLY FOR TEST)
0020              53 EUP2SP  EQU     00100000B       ;P25-I-MOTOR UP2SPD SIGNAL (750SL ONLY)
0040              54 EVLSIR  EQU     01000000B       ;P26-O-VLSI POWER RESET* (750SL ONLY)
0080              55 EDISMS  EQU     10000000B       ;P27-I-HANDSHAKE FOR SUPER-8 TO 8039 I/F
                  56 ;
                  57 ;                               ;T0-I-HANDSHAKE FOR 8039 TO SUPER-8 I/F
                  58 ;
                  59 ;*****************************************************************
                  60 ;  FRAME CONTROL ARRAY:
                  61 ;
                  62 ;     EXTERNAL MEMORY ADDRESSES
                  63 ;
0000              64 EPARRD  EQU     00H             ;R - PARITY BYTE
0001              65 ESRRD   EQU     01H             ;R - SEGMENT REGISTER
0001              66 EFRRST  EQU     01H             ;W - FRAME RESET (CLEARS SEGMENT)
0002              67 EOCIA   EQU     02H             ;R/W - OCIA REGISTERS
0003              68 EFCRST  EQU     03H             ;W - RESET FCA
0004              69 EPRDEC  EQU     04H             ;R - DECODED PARITY BYTE
                  70 ;
                  71 ;     PARITY DECODE BYTE
                  72 ;
000F              73 EDECOD  EQU     00001111B       ;0-9 IS DECODED DIGIT
000A              74 EDECBL  EQU     00001010B       ;A IS BL
000B              75 EDECBR  EQU     00001011B       ;B IS BR
```

```
ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2          PAGE   2
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

 0000              =  77 EDECAR  EQU     000011018      ;D IS AR
 000E              =  78 EDECBE  EQU     000011108      ;E IS NOT USED
 000F              =  79 EDECBF  EQU     000011118      ;F IS "NO DECODE" (ERROR)
 0010              =  80 EDECE   EQU     000100008      ;E-TAG
 0020              =  81 EDECD   EQU     001000008      ;D-TAG
 0040              =  82 EDECBK  EQU     010000008      ;BACKWARD CAPTURE
 0080              =  83 EDECB7  EQU     100000008      ;NOT USED. ALWAYS=1.
                   =  84 ;
                   =  85 ;     SHIFT REGISTER READ
                   =  86 ;
 000F              =  87 ESRCHR  EQU     000011118      ;BCD CHARACTER
 0010              =  88 ESR4CH  EQU     000100008      ;4-CHAR CAPTURE
 0020              =  89 ESRF13  EQU     001000008      ;FRAME 1 OR 3 CAPTURE
 0040              =  90 ESRPER  EQU     010000008      ;PERIODICAL CAPTURE
 0080              =  91 ESRSDT  EQU     100000008      ;SDATA BYTE AVAILABLE
                   =  92 ;*****************************************************************
                   =  93 ;  FLAG REGISTERS:
                   =  94 ;
                   =  95 ;     R80-R4  SCAN FLAGS
                   =  96 ;
 0001              =  97 ESCHG   EQU     000000018      ;SCANNING (FLAG CKFCA TO GET SEGMENTS)
 0002              =  98 ER4B1   EQU     000000108      ;NOT USED
 0004              =  99 ER4B2   EQU     000001008      ;NOT USED
 0008              = 100 ESBFUL  EQU     000010008      ;SEND BUFFER HAS DATA TO SEND
 0010              = 101 ER4B4   EQU     000100008      ;NOT USED
 0020              = 102 EBFREQ  EQU     001000008      ;BUFMAN REQUEST FLAG
 0040              = 103 ER4B6   EQU     010000008      ;NOT USED
 0080              = 104 ER4B7   EQU     100000008      ;NOT USED
                   = 105 ;
                   = 106 ;  R80-86  VERSION POINTER/FLAG
                   = 107 ;
 0000              = 108 EVER00  EQU     00H            ;NO VALID VERSIONS
 0001              = 109 EVERA   EQU     01H            ;UPC-A
 0002              = 110 EVER13  EQU     02H            ;EAN-13
 0003              = 111 EVERE   EQU     03H            ;UPC-E
 0004              = 112 EVER8   EQU     04H            ;EAN-8
 0005              = 113 EVERD1  EQU     05H            ;UPC-D1
 0006              = 114 EVERD2  EQU     06H            ;UPC-D2
 0007              = 115 EVERD3  EQU     07H            ;UPC-D3
 0008              = 116 EVERD4  EQU     08H            ;UPC-D4
 0009              = 117 EVERD5  EQU     09H            ;UPC-D5
                   = 118 ;
 0010              = 119 ER6B4   EQU     000100008      ;NOT USED
 0020              = 120 ER6B5   EQU     001000008      ;NOT USED
 0040              = 121 ER6B6   EQU     010000008      ;NOT USED
 0080              = 122 ER6B7   EQU     100000008      ;NOT USED
                   = 123 ;
                   = 124 ;  SCANNER CONFIGURATION BYTE - CONFIG
                   = 125 ;
 0001              = 126 E4CH2S  EQU     000000018      ;4 CHAR SEG 2 SCAN BIT
 0002              = 127 E6CH2S  EQU     000000108      ;6 CHAR SEG 2 SCAN BIT
                   = 128 ;*****************************************************************
                   = 129 ;  TIMER CONSTANTS:
                   = 130 ;
 0004              = 131 E80MS   EQU      4             ;80 MSEC
 000A              = 132 E200MS  EQU      10            ;200 MSEC
 0018              = 133 E480MS  EQU      24            ;480 MSEC
 0032              = 134 E1000M  EQU      50            ;1000 MSEC, 1.0 SECOND
 0064              = 135 E2000M  EQU     100            ;2000 MSEC, 2.0 SECOND
                   = 136 ;
 0004              = 137 EGDTON  EQU      4             ;80 MSEC, GOOD TONE ON TIME
 0014              = 138 EBDTON  EQU      20            ;400 MSEC, BAD TONE ON TIME
                   = 139 ;
 0028              = 140 ETONCT  EQU      40            ;TONE COUNT (CYCLES/20MS)
 FFFA              = 141 ETONFQ  EQU     -6             ;TONE FREQUENCY CONSTANT (500US)
                   = 142 ;
                   = 143 ;  SUPER-8 INTERFACE EXTERNAL MEMORY ADDRESS
 0008              = 144 ESUP8   EQU     08H
                   = 145 ;
                   = 146 ;  COMMUNICATIONS ROUTINE CONSTANTS
 0088              = 147 ENSKBY  EQU     088H           ;NISSCAN BYTE FOR SEND BUFFER
 00CC              = 148 ETRNBY  EQU     0CCH           ;TERMINATION BYTE FOR SEND BUFFER
                   = 149 ;
                   = 150 ;  COMMUNICATIONS ROUTINE RECEIVE COMMANDS (SUPER-8 TO 8039)
 0011              = 151 ENSCAN  EQU     11H            ;ENABLE SCANNING (LASER ON)
 0012              = 152 DISCAN  EQU     12H            ;DISABLE SCANNING (LASER OFF)
```

```
ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   3
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

 0018             154 DIBEEP  EQU     18H             ;DISABLE TONE AFTER GOOD READ
 0032             155 CDMRST  EQU     32H             ;RESET SCANNER COMMAND
 0077             156 IFRSMC  EQU     77H             ;I/F ROM CHECKSUM GOOD "COMMAND"
                  157 ;
                  158 ;  FLATTOP TIME CONSTANTS
 0008             159 EWAIT   EQU     8               ;VALUE FOR "NO SEGS" WAIT
 002A             160 EGDLTW  EQU     50-EWAIT        ;GD-LT ON WAIT CONSTANT
 0016             161 EDRDLY  EQU     30-EWAIT        ;DOUBLE READ WAIT, IBM-OCR, 0.6 SEC
 002A             162 EDRDLF  EQU     50-EWAIT        ;DOUBLE READ WAIT, FUJITSU, 1.0 SEC
                  163 ;
                  164 ;  RAM POINTERS AND CONSTANTS USED IN THE HORSE TEST
 0030             165 TSEG1   EQU     30H             ;SEGMENT BUFFER
 0034             166 TSEG2   EQU     34H
 0038             167 TCNT1   EQU     38H             ;SEGMENT COUNTER
 003A             168 TCNT2   EQU     3AH
 0050             169 TSCBUF  EQU     50H             ;FCA READ BUFFER
 0001             170 EHCNTL  EQU     001H            ;HORSE CONTROL BYTE
                  171 ;*****************************************************************
                  172 ;  DATA MEMORY MAP - RAM - 8039 NEEDED
                  173 ;
                  174 ;       REGISTER BANK 0  (NON-INTERRUPT USEAGE)
 0000             175         ORG     000H
 0000             176 MRB0:   DS      4               ;R0 TO R3 - SCRATCH
 0004             177 SCNFLG: DS      1               ;R4 - SCAN FLAGS
 0005             178 DRTIMR: DS      1               ;R5 - DOUBLE READ TIMER
 0006             179 VERFLG: DS      1               ;R6 - VERSION POINTER/FLAG
 0007             180 TIMREG: DS      1               ;R7 - GENERAL PURPOSE TIMER/COUNTER
                  181 ;
                  182 ;       STACK AREA
 0008             183 STACK:  DS      16              ;8 LEVELS OF SUBROUTINES ALLOWED
                  184 ;
                  185 ;       REGISTER BANK 1  (INTERRUPT USEAGE)
 0018             186 MRB1:   DS      3               ;R0 TO R2 - SCRATCH (NOT USED)
 0018             187 MRB1R3: DS      1               ;R3 - GOOD READ TONE DISABLE FLAG
 001C             188 MRB1R4: DS      1               ;R4 - NOT USED
 001D             189 TONCNT: DS      1               ;R5 - TONE CYCLE COUNTER (CYCLES/20MS)
 001E             190 TONLTH: DS      1               ;R6 - TONE LENGTH COUNTER
 001F             191 TASAVE: DS      1               ;R7 - TIMER "A" SAVE REGISTER
                  192 ;
                  193 ;       FREE MEMORY AREA
                  194 ;
                  195 ;         SEGMENT BUFFERS
 0020             196 SEGBUF  EQU     $
 0020             197 SCNBUF: DS      4               ;SCAN BUFFER
                  198 ;
 0024             199 BF6CST  EQU     $
 0024             200 L6S1:   DS      4               ;SCAN 1 BUFFER
 0028             201 L6S2:   DS      4               ;SCAN 2 BUFFER
 002C             202 L6SCNT: DS      1               ;PACKED SCAN COUNTER (SCAN2/SCAN1)
 002D             203 L6STOT: DS      1               ;TOTAL COUNTER
                  204 ;
 002E             205 R6S1:   DS      3
 0031             206 R6S2:   DS      3
 0034             207 R6SCNT: DS      1
 0035             208 R6STOT: DS      1
 0012             209 BF6CNT  EQU     $-BF6CST
                  210 ;
 0036             211 BF4CST  EQU     $
 0036             212 L4S1:   DS      2
 0038             213 L4S2:   DS      2
 003A             214 L4SCNT: DS      1
 0038             215 L4STOT: DS      1
                  216 ;
 003C             217 R4S1:   DS      2
 003E             218 R4S2:   DS      2
 0040             219 R4SCNT: DS      1
 0041             220 R4STOT: DS      1
                  221 ;
 0042             222 N1S1:   DS      2
 0044             223 N1S2:   DS      2
 0046             224 N1SCNT: DS      1
 0047             225 N1STOT: DS      1
                  226 ;
 0048             227 N2S1:   DS      2
 004A             228 N2S2:   DS      2
 004C             229 N2SCNT: DS      1
```

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ISIS-II MCS-48/UP1-41 MACRO ASSEMBLER, V4.2                PAGE    4
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                   = 231 ;
 004E              = 232 M3S1:   DS      2
 0050              = 233 M3S2:   DS      2
 0052              = 234 M3SCNT: DS      1
 0053              = 235 M3STOT: DS      1
                   = 236 ;
 0054              = 237 M4S1:   DS      2
 0056              = 238 M4S2:   DS      2
 0058              = 239 M4SCNT: DS      1
 0059              = 240 M4STOT: DS      1
                   = 241 ;
 005A              = 242 M5S1:   DS      2
 005C              = 243 M5S2:   DS      2
 005E              = 244 M5SCNT: DS      1
 005F              = 245 M5STOT: DS      1
                   = 246 ;
 0060              = 247 M6S1:   DS      2
 0062              = 248 M6S2:   DS      2
 0064              = 249 M6SCNT: DS      1
 0065              = 250 M6STOT: DS      1
 0030              = 251 BF4CNT  EQU     $-BF4CST
                   = 252 ;
                   = 253 ;        SEND BUFFER
 0066              = 254 SBFPNT: DS      1               ;POINTER
                   = 255 ;
 0067              = 256 SBUFAD  EQU     $               ;FIRST DATA BYTE ADDRESS
 0067              = 257 SBUF:   DS      18              ;DATA BUFFER
 00CE              = 258 SBSTRT  EQU     2*SBUF          ;PACKED BUFFER START POINTER
 0012              = 259 SBUFSZ  EQU     $-SBUF          ;BYTES IN SEND BUFFER
 0078              = 260 SBFEND  EQU     $-1             ;LAST RAM LOCATION IN BUFFER
                   = 261 ;
                   = 262 ;  WORK AREA USED BY ENCD10 ROUTINE
 0079              = 263 WRKBUF: DS      3
                   = 264 ;
                   = 265 ;  DOUBLE READ LABEL DATA SUM LOCATION
 007C              = 266 DRSUM:  DS      1
                   = 267 ;
                   = 268 ;  SCANNER CONFIGURATION BYTE LOCATION
 007D              = 269 CONFIG: DS      1
                   = 270 ;
 007D              = 271 LSTUSD  EQU     $-1             ;LAST USED RAM LOCATION
                     272 ;  FVECTR.SRC INCLUDES FTIMER.SRC
                     273 $       INCLUDE(:F1:FVECTR.SRC)
                   = 274 ;*****************************************************************
                   = 275 ;  FILE:  FVECTR.SRC  06-16-86 13:00  BOB ACTIS
                   = 276 ;
                   = 277 ;  RESET AND INTERRUPT VECTORS
                   = 278 ;
 0000              = 279         ORG     000H            ;RESET TRAP
 0000 E5           = 280 RSTTRP: SEL     MB0
 0001 649F         = 281         JMP     POWUP           ;GO START PROGRAM
                   = 282 ;
 0003              = 283         ORG     003H            ;EXTERNAL INTERRUPT TRAP
 0003 93           = 284 INTTRP: RETR                    ;RETURN FROM SPURIOUS INTERRUPTS
                   = 285 ;
 0007              = 286         ORG     007H            ;INTERNAL TIMER INTERRUPT TRAP
 0007              = 287 TINTRP  EQU     $               ;GO TO TIMER ROUTINE
                   = 288 $       INCLUDE(:F1:FTIMER.SRC)
                  1= 289 ;*****************************************************************
                  1= 290 ;  FILE:  FTIMER.SRC  10-08-86 15:40  BOB ACTIS
                  1= 291 ;  FUNCTION:  IF NO TONE IN PROGRESS, DECREMENT RB0-R5 & R7 UNTIL 0.
                  1= 292 ;             IF TONE IN PROGRESS, DECREMENT RB1-R6 UNTIL 0.
                  1= 293 ;  ENTRY:  RB1-R6 = TONE LENGTH IN 20'S OF MS.
                  1= 294 ;          RB1-R4 = IBM-4683 CLOCK TIMER
                  1= 295 ;          RB0-R5 = DOUBLE READ TIMER COUNTER
                  1= 296 ;          RB0-R7 = GENERAL PURPOSE TIMER COUNTER
                  1= 297 ;  EXIT:   RB1-R7 = ACCUMULATOR SAVE
                  1= 298 ;          RB1-R5 = TONE CYCLE COUNTER
                  1= 299 ;          RB1-R6 = DECREMENTED UNTIL 0
                  1= 300 ;          RB1-R4 = DECREMENTED UNTIL 0
                  1= 301 ;          RB0-R5 = DECREMENTED UNTIL 0
                  1= 302 ;          RB0-R7 = DECREMENTED UNTIL 0
 0007 D5          1= 303 TIMER:  SEL     RB1
 0008 AF          1= 304         MOV     R7,A            ;SAVE A
 0009 FE          1= 305         MOV     A,R6            ;GET TONE COUNTER
 000A 961F        1= 306         JNZ     TIME30          ;JUMP IF TONE IN PROGRESS
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE    5
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

000C FC        1= 308          MOV     A,R4
000D C610      1= 309          JZ      TIME02          ;JUMP IF IBM-4683 TIMER = 0
000F CC        1= 310          DEC     R4
               1= 311 ;
0010 C5        1= 312 TIME02: SEL     RB0
0011 FF        1= 313          MOV     A,R7
0012 C615      1= 314          JZ      TIME05          ;JUMP IF TIMER COUNTER = 0
0014 CF        1= 315          DEC     R7
               1= 316 ;
0015 FD        1= 317 TIME05: MOV     A,R5
0016 C619      1= 318          JZ      TIME10          ;JUMP IF DOUBLE READ TIMER = 0
0018 CD        1= 319          DEC     R5
               1= 320 ;
0019 2306      1= 321 TIME10: MOV     A,#-250         ;20MS/80US = 250
001B 62        1= 322 TIME20: MOV     T,A             ;SET TIMER COUNTER
001C D5        1= 323          SEL     RB1
001D FF        1= 324          MOV     A,R7            ;RESTORE A
001E 93        1= 325          RETR
               1= 326 ;
001F 09        1= 327 TIME30: IN      A,P1            ;GET TONE BIT
0020 997F      1= 328          ANL     P1,#255-ETONE   ;SET TONE BIT LOW
0022 F226      1= 329          JB7     TIME40          ;JUMP IF TONE BIT WAS HIGH
0024 8980      1= 330          ORL     P1,#ETONE       ;SET TONE BIT HIGH
               1= 331 ;
0026 55        1= 332 TIME40: STRT    T               ;CLEAR THE PRESCALAR
0027 ED38      1= 333          DJNZ    R5,TIME60       ;JUMP IF NOT 20MS YET
0029 BD28      1= 334          MOV     R5,#ETONCT      ;SET TONE CYCLE COUNTER
               1= 335 ;
002B FC        1= 336          MOV     A,R4
002C C62F      1= 337          JZ      TIME45          ;JUMP IF IBM-4683 TIMER = 0
002E CC        1= 338          DEC     R4
               1= 339 ;
002F C5        1= 340 TIME45: SEL     RB0
0030 FF        1= 341          MOV     A,R7
0031 C634      1= 342          JZ      TIME50          ;JUMP IF TIMER COUNTER = 0
0033 CF        1= 343          DEC     R7
               1= 344 ;
0034 D5        1= 345 TIME50: SEL     RB1
0035 EE38      1= 346          DJNZ    R6,TIME60       ;JUMP IF TONE NOT FINISHED
0037 8980      1= 347          ORL     P1,#ETONE       ;LEAVE TONE LINE HIGH
0039 0419      1= 348          JMP     TIME10
               1= 349 ;
003B 23FA      1= 350 TIME60: MOV     A,#ETONFQ       ;SET TONE FREQ CONSTANT
003D 0418      1= 351          JMP     TIME20
                 352 $        INCLUDE(:F1:FSDATA.SRC)
               = 353 ;*****************************************************************
               = 354 ;  FILE:  FSDATA.SRC  10-06-86 14:05  BOB ACTIS
               = 355 ;                                    -- --
               = 356 ;  ROUTINE:  SDATA
               = 357 ;  FUNCTION:  CLEAR THE SDATA BYTE THEN RETURN.
               = 358 ;              THE 750SL DOES NOT IMPLEMENT MORSE OR RESET FROM SDATA
               = 359 ;  ENTRY:  RB0
               = 360 ;            SDATA READY IN FCA
               = 361 ;  EXIT:  USES R0,A
               = 362 ;
003F B802      = 363 SDATA:  MOV     R0,#EOCIA       ;ENTERED FROM CKFCA ROUTINE
0041 80        = 364          MOVX    A,@R0           ;GET SDATA BYTE
               = 365 ;
0042 D3D1      = 366 SDATA4: XRL     A,#EKCNTL
0044 9656      = 367          JNZ     SDATA9          ;JUMP IF NOT THE MORSE CONTROL BYTE
0046 27        = 368 SDATAN: CLR     A       ;CLEAR STACK POINTER/RETURN LINKAGE SINCE WE
0047 D7        = 369          MOV     PSW,A   ;WILL JUMP INTO MORSE TEST AND STAY THERE
0048 C5        = 370          SEL     RB0             ;SETUP FOR MORSE TEST ENTRY
0049 B5        = 371          CLR     F0
004A 95        = 372          CPL     F0              ;SET FLAG FOR CONTROL BYTE RECEIVED
004B A5        = 373          CLR     F1
004C B830      = 374          MOV     R0,#TSEG1
004E B810      = 375          MOV     R3,#16
0050 99DF      = 376          ANL     P1,#255-EGDLT
0052 B952      = 377          ORL     P1,#EBDLT+ELASDB+ENTREB  ;BDLT & MOTOR ON, LASER OFF
0054 840A      = 378          JMP     TMOOS           ;BDLT INDICATES CNTL BYTE RECEIVED
               = 379 ;
0056 83        = 380 SDATA9: RET                     ;SPURIOUS SDATA
                 381 ;*************************************
0057 A3          382 TROPGO: MOVP    A,@A
0058 83          383         RET
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE    6
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

                   385 $       INCLUDE(:F1:TROMSM.SRC)
                 = 386 ;*****************************************************************
                 = 387 ; ROUTINE: TROMSM   10-07-86 10:40  BOB ACTIS
                 = 388 ;
                 = 389 ; FUNCTION - SUM ALL BYTES IN BOTH MEMORY BANKS
                 = 390 ;       ASSUMES THAT EACH OF THE SIXTEEN PAGES CONTAINS THE
                 = 391 ;       SEQUENCE "TROPGX: MOVP A,@A ; RET" FOR PAGE X.
                 = 392 ;
0100 B908        = 393 TROMSM: MOV     R1,#STACK+3     ; R1 POINTS TO SECOND STACK ENTRY
                 = 394 ;
                 = 395 ; DO SIXTEEN PAGES WITH 256 BYTES PER PAGE
                 = 396 ;
0102 27          = 397         CLR     A
0103 A1          = 398         MOV     @R1,A           ; STACK+3 = PAGE 0 TO START
0104 AA          = 399         MOV     R2,A            ; R2 = BYTE ADDRESS
0105 B810        = 400         MOV     R3,#16          ; R3 = PAGES TO DO
0107 A8          = 401         MOV     R0,A            ; R0 = SUM OF BYTES
0108 D7          = 402         MOV     PSW,A           ; INSURE STACK IS EMPTY
                 = 403 ;
                 = 404 ; PUT PAGE ACCESS ADDRESS IN STACK
                 = 405 ;
0109 F1          = 406 TRO10:  MOV     A,@R1
010A 0321        = 407         ADD     A,#LOW TROTAB
010C A3          = 408         MOVP    A,@A
010D C9          = 409         DEC     R1
010E A1          = 410         MOV     @R1,A
010F 19          = 411         INC     R1
                 = 412 ;
                 = 413 ; DO A PAGE
                 = 414 ;
0110 341C        = 415 TRO20:  CALL    TRO50           ; FETCH BYTE
0112 68          = 416         ADD     A,R0            ; ADD TO SUM
0113 A8          = 417         MOV     R0,A
0114 EA10        = 418         DJNZ    R2,TRO20        ; JMP = NOT DONE WITH PAGE
0116 11          = 419         INC     @R1             ; PAGE NUMBER INCREMENTED¶
0117 EB09        = 420         DJNZ    R3,TRO10        ; JMP = NOT THRU WITH PAGES
0119 17          = 421         INC     A               ; (A) = ZERO FOR CORRECT SUM
011A 644F        = 422         JMP     TRORET
                 = 423 ;
                 = 424 ; LINK TO EACH PAGE
                 = 425 ;
011C 2302        = 426 TRO50:  MOV     A,#02
011E D7          = 427         MOV     PSW,A           ; SET STACK POINTER AHEAD
011F FA          = 428         MOV     A,R2            ; A = ADDRESS OF BYTE TO FETCH
0120 83          = 429         RET                     ; JMP TO SELECTED PAGE
                 = 430 ;
                 = 431 ; TABLE FOR ADDRESS OF FETCH ROUTINE IN EACH PAGE
                 = 432 ;
0121 57          = 433 TROTAB: DB      LOW TROPG0
0122 76          = 434         DB      LOW TROPG1
0123 80          = 435         DB      LOW TROPG2
0124 E3          = 436         DB      LOW TROPG3
0125 C6          = 437         DB      LOW TROPG4
0126 43          = 438         DB      LOW TROPG5
0127 D3          = 439         DB      LOW TROPG6
0128 6E          = 440         DB      LOW TROPG7
0129 E4          = 441         DB      LOW TROPG8
012A D4          = 442         DB      LOW TROPG9
012B CC          = 443         DB      LOW TROPGA
012C D7          = 444         DB      LOW TROPGB
012D E8          = 445         DB      LOW TROPGC
012E E3          = 446         DB      LOW TROPGD
012F A8          = 447         DB      LOW TROPGE
0130 AD          = 448         DB      LOW TROPGF
                   449 $       INCLUDE(:F1:TRAM.SRC)
                 = 450 ;*****************************************************************
                 = 451 ;  FILE:  TRAM.SRC  6-19-86 11:20  BOB ACTIS
                 = 452 ;  FUNCTION:  TEST THE 8039 RAM LOCATIONS 0 TO 7FH
                 = 453 ;  ENTRY:  NO SETUP
                 = 454 ;  EXIT:  RAM HAS GARBAGE (TEST PATTERN)
                 = 455 ;
                 = 456 ;  START BY WRITTING EACH RAM ADDRESS INTO ITSELF
0131 B87F        = 457 TRAM:   MOV     R0,#7FH         ;SIZE OF 8039 RAM
0133 F8          = 458 TRAM10: MOV     A,R0            ;GET RAM ADDRESS
0134 A0          = 459         MOV     @R0,A           ;STORE RAM ADDRESS IN IT'S LOCATION
0135 E833        = 460         DJNZ    R0,TRAM10       ;DO ALL LOCATIONS
```

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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2          PAGE    7
GNA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                  = 462 ;  CHECK IF EACH LOCATION HAS IT'S OWN ADDRESS
 0137 B87F        = 463            MOV     R0,#7FH
 0139 F8          = 464 TRAM20: MOV     A,R0              ;GET RAM ADRESS
 013A D0          = 465            XRL     A,@R0             ;COMPARE ADDRESS TO CONTENTS
 013B 9674        = 466            JNZ     TRAMER            ;JUMP IF ERROR
 013D E839        = 467            DJNZ    R0,TRAM20         ;DO ALL LOCATIONS
                  = 468 ;
                  = 469 ;  TRY A 055H/0AAH CHECKER BOARD PATTERN
 013F B802        = 470            MOV     R0,#2             ;POINTER WILL GO FROM 2 TO 7FH
 0141 2355        = 471 TRAM30: MOV     A,#055H
 0143 A0          = 472            MOV     @R0,A             ;WRITE EVEN LOCATION
 0144 37          = 473            CPL     A                 ;PATTERN IS NOW 0AAH
 0145 18          = 474            INC     R0
 0146 A0          = 475            MOV     @R0,A             ;WRITE ODD LOCATION
 0147 18          = 476            INC     R0
 0148 F8          = 477            MOV     A,R0              ;GET NEXT ADDRESS
 0149 37          = 478            CPL     A
 014A F241        = 479            JB7     TRAM30            ;JUMP IF NOT DONE YET,  R0 < 80H
                  = 480 ;
                  = 481 ;  CHECK THE 055H/0AAH TEST PATTERN
 014C B902        = 482            MOV     R1,#2             ;USE R1 AS POINTER IN THIS SECTION
 014E F1          = 483 TRAM40: MOV     A,@R1             ;GET EVEN BYTE DATA, 055H
 014F 19          = 484            INC     R1
 0150 61          = 485            ADD     A,@R1             ;ADD ODD BYTE DATA, 0AAH
 0151 17          = 486            INC     A                 ;055H+0AAH+1=000H
 0152 9674        = 487            JNZ     TRAMER            ;JUMP IF ERROR
 0154 19          = 488            INC     R1
 0155 F9          = 489            MOV     A,R1              ;GET NEXT ADDRESS
 0156 37          = 490            CPL     A
 0157 F24E        = 491            JB7     TRAM40            ;JUMP IF NOT DONE YET
                  = 492 ;
                  = 493 ;  TRY A 0AAH/055H CHECKER BOARD PATTERN
 0159 B902        = 494            MOV     R1,#2             ;POINTER WILL GO FROM 2 TO 7FH
 015B 23AA        = 495 TRAM50: MOV     A,#0AAH
 015D A1          = 496            MOV     @R1,A             ;WRITE EVEN LOCATION
 015E 37          = 497            CPL     A                 ;PATTERN IS NOW 055H
 015F 19          = 498            INC     R1
 0160 A1          = 499            MOV     @R1,A             ;WRITE ODD LOCATION
 0161 19          = 500            INC     R1
 0162 F9          = 501            MOV     A,R1              ;GET NEXT ADDRESS
 0163 37          = 502            CPL     A
 0164 F258        = 503            JB7     TRAM50            ;JUMP IF NOT DONE YET,  R1 < 80H
                  = 504 ;
                  = 505 ;  CHECK THE 0AAH/055H TEST PATTERN
 0166 B802        = 506            MOV     R0,#2             ;USE R0 AS POINTER IN THIS SECTION
 0168 F0          = 507 TRAM60: MOV     A,@R0             ;GET EVEN BYTE DATA, 0AAH
 0169 18          = 508            INC     R0
 016A 60          = 509            ADD     A,@R0             ;ADD ODD BYTE DATA, 055H
 016B 17          = 510            INC     A                 ;0AAH+055H+1=000H
 016C 9674        = 511            JNZ     TRAMER            ;JUMP IF ERROR
 016E 18          = 512            INC     R0
 016F F8          = 513            MOV     A,R0              ;GET NEXT ADDRESS
 0170 37          = 514            CPL     A
 0171 F268        = 515            JB7     TRAM60            ;JUMP IF NOT DONE YET
                  = 516 ;
 0173 27          = 517            CLR     A                 ;A=0 INDICATES TEST PASSED
 0174 6457        = 518 TRAMER: JMP     TRARET            ;RETURN FROM RAM TEST
                    519 ;       INCLUDE(:F1:TOCIA.SRC)          ; 750F ONLY              <----
                    520 ;*****************************************
 0176 A3          = 521 TROPG1: MOVP    A,@A
 0177 83          = 522          RET
 0200             = 523          ORG     200H
                    524 $       INCLUDE(:F1:TTAG.SRC)
                  = 525 ;*****************************************************************************
                  = 526 ; ROUTINE: TTAG  06-19-86 15:30  BOB ACTIS
                  = 527 ;
                  = 528 ; FUNCTION: CHECK DIGITAL LOGIC FOR CAPTURE OF 6 INCREASINGLY
                  = 529 ;       LARGER TAGS - 012345 678912 .  THE SYMBOL CAPTURE
                  = 530 ;       PROCESSING IS USED TO COLLECT THE SEGMENTS FROM THE FCA.
                  = 531 ;
 0200 FE          = 532 TTATAB: DB      0FEH,9AH,64H,16H,0B7H,0D0H,0A8H
 0201 9A          =
 0202 64          =
 0203 16          =
 0204 B7          =
 0205 D0          =
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ISIS-II MCS-48/UP1-41 MACRO ASSEMBLER, V4.2                PAGE    8
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

 0207 3A           = 533         DB      3AH,089H,42H,086H,59H,2EH,03EH
 0208 89           =
 0209 42           =
 020A 86           =
 0208 59           =
 020C 2E           =
 020D 3E           =
 020E B803         = 534 TTAG:   MOV     R0,#EFCRST
 0210 90           = 535         MOVX    @R0,A           ;RESET FCA
 0211 8901         = 536         ORL     P1,#ETEST       ;TEST CONTROL ACTIVE
 0213 B800         = 537         MOV     R0,#LOW( TTATAB          ; R0 POINTS TO CHAR GEN TABLE
 0215 BE06         = 538         MOV     R6,#06H ;THIS ROUTINE CHECKS DIGITAL LOGIC
 0217 BF06         = 539         MOV     R7,#06H ;FOR CAPTURE OF 6 INCREASINGLY LARGER
 0219 B908         = 540         MOV     R1,#08H ;TAGS 012345 678912.....................
 021B B80E         = 541         MOV     R3,#0EH ;UNPACK DATA CONSTANT
 021D FB           = 542 UNPK1:  MOV     A,R0
 021E BA04         = 543         MOV     R2,#04H ;UNPACK DATA CONSTANT
 0220 A3           = 544         MOVP    A,@A
 0221 AC           = 545         MOV     R4,A    ;TEMP STORE
 0222 5301         = 546 UNPK2:  ANL     A,#01H  ;STRIP OUT ONE BIT
 0224 E7           = 547         RL      A
 0225 17           = 548         INC     A
 0226 47           = 549         SWAP    A
 0227 AD           = 550         MOV     R5,A
 0228 FC           = 551         MOV     A,R4
 0229 77           = 552         RR      A
 022A AC           = 553         MOV     R4,A
 022B 5301         = 554         ANL     A,#01H
 022D E7           = 555         RL      A
 022E 17           = 556         INC     A
 022F 6D           = 557         ADD     A,R5
 0230 A1           = 558         MOV     @R1,A
 0231 19           = 559         INC     R1
 0232 FC           = 560         MOV     A,R4
 0233 77           = 561         RR      A
 0234 AC           = 562         MOV     R4,A
 0235 EA22         = 563         DJNZ    R2,UNPK2
 0237 18           = 564         INC     R0
 0238 EB1D         = 565         DJNZ    R3,UNPK1
                   = 566 ;
                   = 567 ;  SETUP TEST BIT ON PORT 1
                   = 568 ;
 023A 2390         = 569         MOV     A,#ETEST+EP12+EP13+ELASDB+ETONE
 023C 39           = 570         OUTL    P1,A
                   = 571 ;
 023D B802         = 572         MOV     R3,#02H
 023F BD06         = 573         MOV     R5,#06H
 0241 BA38         = 574 TEST1:  MOV     R2,#38H ;START TAG POINTER
 0243 B83F         = 575         MOV     R0,#3FH
 0245 FD           = 576 TEST2:  MOV     A,R5    ;START TAG OUTPUT
 0246 6B           = 577         ADD     A,R3
 0247 AC           = 578         MOV     R4,A
 0248 EC48         = 579 TEST3:  DJNZ    R4,TEST3
 024A F0           = 580         MOV     A,@R0
                   = 581 ;
 024B 3251         = 582         JB1     TST31   ;JUMP = SEND SPACE
 024D 99FD         = 583         ANL     P1,#0FFH-ETMARK
 024F 4455         = 584         JMP     TST32
 0251 8902         = 585 TST31:  ORL     P1,#ETMARK
 0253 00           = 586         NOP
 0254 00           = 587         NOP
                   = 588 ;
 0255 FD           = 589 TST32:  MOV     A,R5
 0256 6B           = 590         ADD     A,R3
 0257 AC           = 591         MOV     R4,A
 0258 EC58         = 592 TEST4:  DJNZ    R4,TEST4
 025A F0           = 593         MOV     A,@R0
                   = 594 ;
 025B 47           = 595         SWAP    A
 025C 3262         = 596         JB1     TST41   ;JUMP = SEND SPACE
 025E 99FD         = 597         ANL     P1,#0FFH-ETMARK
 0260 4466         = 598         JMP     TST42
 0262 8902         = 599 TST41:  ORL     P1,#ETMARK
 0264 00           = 600         NOP
 0265 00           = 601         NOP
                   = 602 ;
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                    PAGE    9
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

0267 EA45          = 604          DJNZ    R2,TEST2        ;END OF TAG
0269 ED41          = 605          DJNZ    R5,TEST1        ;END OF ALL TAGS
                   = 606 ;
026B F5            = 607          SEL     MB1
026C 1400          = 608          CALL    CLR6SG          ;CLEAR 6 CHAR SEG BUFFS & COUNTERS
026E E5            = 609          SEL     MB0
                   = 610 ;
026F BE18          = 611          MOV     R6,#24          ;SHOULD BE ONLY 12 SEGS, TRY FOR MORE
0271 FC            = 612          MOV     A,R4
0272 4301          = 613          ORL     A,#ESCNG        ;SET SCAN FLAG SO CKFCA WILL
0274 AC            = 614          MOV     R4,A            ;PUT SEGMENTS INTO THE SCAN BUFF
0275 F5            = 615 GETLUP:  SEL     MB1
0276 1644          = 616          CALL    CKFCA           ;GET SEG, IF ANY, FROM FCA
0278 5404          = 617          CALL    PROCSG          ;PUT SEG, IF ANY, INTO SEG BUFF
027A E5            = 618          SEL     MB0
027B EE75          = 619          DJNZ    R6,GETLUP       ;GO CHECK FOR MORE SEGMENTS
                   = 620 ;
027D B5            = 621          CLR     F0
027E B82C          = 622          MOV     R0,#L6SCNT      ;SETUP FOR RIGHT HALF LOOP
0280 F0            = 623 TCKCNT:  MOV     A,@R0
0281 18            = 624          INC     R0              ;GET L OR R COUNT
0282 60            = 625          ADD     A,@R0
0283 03F4          = 626          ADD     A,#-12          ;GET L OR R TOTAL
0285 96A7          = 627          JNZ     TTA90           ;JUMP IF X6SCNT+X6STOT<>12
                   = 628 ;
0287 B834          = 629          MOV     R0,#R6SCNT
0289 95            = 630          CPL     F0
028A B680          = 631          JF0     TCKCNT          ;JUMP TO DO RIGHT HALF
                   = 632 ;
028C BA04          = 633          MOV     R2,#4           ;4 BYTES TO COMPARE
028E B824          = 634          MOV     R0,#L6S1
0290 B9A9          = 635          MOV     R1,#LOW TTACHK  ;DATA CHECK TABLE
0292 F9            = 636 LOOPCK:  MOV     A,R1
0293 A3            = 637          MOVP    A,@A
0294 D0            = 638          XRL     A,@R0
0295 96A7          = 639          JNZ     TTA90           ;JMP IF BAD CHECK OF DATA
                   = 640 ;
0297 18            = 641          INC     R0
0298 19            = 642          INC     R1
0299 EA92          = 643          DJNZ    R2,LOOPCK
                   = 644 ;
029B B82E          = 645          MOV     R0,#R6S1
029D BA03          = 646          MOV     R2,#3           ;3 BYTES TO COMPARE
029F 95            = 647          CPL     F0
02A0 B692          = 648          JF0     LOOPCK          ;JUMP TO DO RIGHT HALF
                   = 649 ;
02A2 B87F          = 650          MOV     R0,#7FH         ;LOOP COUNTER, RAM SIZE
02A4 A0            = 651 CLRRAM:  MOV     @R0,A           ;A=0 AT THIS POINT, TEST PASSED
02A5 E8A4          = 652          DJNZ    R0,CLRRAM       ;CLEAR ALL RAM AFTER TESTING
                   = 653 ;
02A7 6469          = 654 TTA90:   JMP     TTARET          ;A=0 FOR SUCCESFUL COMPLETION
                   = 655 ;
02A9 01            = 656 TTACHK:  DB      01H,23H,45H,0CH
02AA 23            =
02AB 45            =
02AC 0C            =
02AD 67            = 657          DB      67H,89H,12H
02AE 89            =
02AF 12            =
                     658 ;**************************************
0280 A3              659 TROPG2: MOVP    A,@A
0281 83              660         RET
0300                 661         ORG     300H
                     662 $       INCLUDE(:F1:TMOTOR.SRC)        ; NOT USED IN 750F    <----
                   = 663 ;**************************************************************************
                   = 664 ;  FILE:  TMOTOR.SRC  9-11-86 08:45  BOB ACTIS
                   = 665 ;  FUNCTION:  TEST THE MOTOR AND UP2SPD SIGNAL
                   = 666 ;  ENTRY:  NO SETUP
                   = 667 ;  EXIT:  USES R3,R7
                   = 668 ;
0300 8912          = 669 TMOTOR:  ORL     P1,#ELASDB+ENTREB       ;LASER OFF, MOTOR ON
0302 55            = 670          STRT    T
0303 25            = 671          EN      TCNTI           ;ENABLE THE TIMER
                   = 672 ;
0304 BF05          = 673          MOV     R7,#5           ;SET TIMER FOR 100MSEC
0306 FF            = 674 TMOT10:  MOV     A,R7
```

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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   12
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

                  826 ;
                  827 ;  SETUP PORTS
 03A5 238F        828         MOV     A,#255-EVLSIR   ;PWR RST THE VLSI (NO EFFECT ON 750F)
 03A7 3A          829         OUTL    P2,A
 03A8 8A40        830         ORL     P2,#EVLSIR      ;ENABLE VLSI TO RUN
 03AA 239C        831         MOV     A,#EP12+EP13+ETONE+ELASDB
 03AC 39          832         OUTL    P1,A
                  833 ;
                  834 ;  RESET THE FRAME CONTROL ARRAY
 03AD B803        835         MOV     R0,#EFCRST
 03AF 90          836         MOVX    @R0,A
                  837 ;
                  838 ;  GO PERFORM THE POWER UP TESTS.
                  839 ;  STICK IN TPON LOOP IF ANY FAILURES.
 0380 6440        840         JMP     TPON
 0382             841 TPORET  EQU     $
                  842 ;
                  843 ;  TPON PASSED.  START THE INTERNAL TIMER
 0382 D5          844         SEL     RB1
 0383 BD28        845         MOV     R5,#ETONCT      ;SET THE TONE CYCLE COUNTER
 0385 C5          846         SEL     RB0
 0386 55          847         STRT    T
 0387 25          848         EN      TCNTI
                  849 ;
                  850 ;  GREEN LIGHT, GOOD POWER UP TONE, LASER ON AND WAIT 1 SEC.
 0388 8920        851         ORL     P1,#ELDLT
 038A D5          852         SEL     RB1
 038B BE04        853         MOV     R6,#E80MS       ;200MSEC BEEP FOR 750SL, 80MS FOR 750F
 038D C5          854         SEL     RB0
 038E 99EF        855         ANL     P1,#255-ELASDB  ;LASER ON, TIME TO START BEFORE RDTAG
 03C0 BF32        856         MOV     R7,#E1000M
 03C2 FF          857 TPON15: MOV     A,R7
 03C3 96C2        858         JNZ     TPON15          ;WAIT
                  859 ;
                  860 ;  REINITIALIZE AFTER TEST SEQUENCE
 03C5 99CF        861 POU20:  ANL     P1,#255-(EGDLT+ELASDB)  ;GOOD LIGHT OFF & LASER ON
 03C7 8942        862         ORL     P1,#EBDLT+EMTREB        ;BAD LIGHT ON & MOTOR ON (NO MOTOR ON F)
                  863 ;
 03C9 B803        864         MOV     R0,#EFCRST
 03CB 90          865         MOVX    @R0,A           ;RESET THE FCA
 03CC BF02        866         MOV     R7,#2           ;SET TIMER FOR 40 MSEC
 03CE FF          867 POU25:  MOV     A,R7
 03CF 96CE        868         JNZ     POU25           ;WAIT FOR FCA TO SEE SEGS IF ANY
                  869 ;
                  870 ;  CLEAR DATA MEMORY AND PSW
 0301 27          871         CLR     A
 0302 D7          872         MOV     PSW,A           ;CLEAR THE PSW
 0303 B87F        873         MOV     R0,#7FH
 0305 A0          874 POU30:  MOV     @R0,A           ;CLEAR MEMORY
 0306 E805        875         DJNZ    R0,POU30
                  876 ;
 0308 D5          877         SEL     RB1
 0309 BD28        878         MOV     R5,#ETONCT      ;SET THE TONE CYCLE COUNTER
 030B C5          879         SEL     RB0
                  880 ;
 03DC B87D        881         MOV     R0,#CONFIG
 03DE 8000        882         MOV     @R0,#0          ;SETUP CONFIGURATION REGISTER
                  883 ;
 03E0 F5          884         SEL     MB1
 03E1 C400        885         JMP     RDTAG
                  886 ;*****************************************
 03E3 A3          887 TROPG3: MOVP    A,@A
 03E4 83          888         RET
 0400             889         ORG     400H
                  890 $       INCLUDE(:F1:NORSE1.SRC)
                  891 ;*****************************************************************
                  892 ;  FILE:  NORSE1.SRC   NORSE TEST PART 1 OF 3.
                  893 ;  07-03-86 09:05 BOB ACTIS
                  894 ;
                  895 ;  ROUTINE: TNORSE
                  896 ;
                  897 ;       NORSE TEST (HOST ORIGINATED SEGMENT EVALUATION) WILL RECEIVE
                  898 ;       TEST TAG DEFINITION FROM HOST, COUNT THE NUMBER OF TIMES IT
                  899 ;       'SEES' EACH SEGMENT OF THE TAG AND THEN SEND THE COUNT
                  900 ;       INFORMATION TO THE HOST....REMAINS IN NORSE TEST UNTIL
                  901 ;       DSATA=0, OR POWER RESET.
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE  10
GNA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

                  676 ;
0309 0A           677         IN      A,P2
030A 37           678         CPL     A
030B B22F         679         JB5     TMOT50          ;JUMP IF NOT UP2SPD
                  680 ;
                  681 ;  MOTOR OFF AND WAIT FOR IT TO SLOW.  FLASH BOTH LIGHTS.
030D 99FD         682         ANL     P1,#255-ENTREB  ;MOTOR OFF
030F B832         683 TMOT20: MOV     R3,#50          ;SET LOOP COUNTER
0311 BF05         684 TMOT22: MOV     R7,#5           ;SET TIMER FOR 100MSEC
0313              685 TMOT24  EQU     $
                  686 ;       CALL    CK4MRS          ;CHECK FOR MORSE CONTROL BYTE (NOT IMPLEMENTED)
0313 FF           687         MOV     A,R7            ;20MSEC*5*50=5SEC
0314 9613         688         JNZ     TMOT24          ;WAIT BETWEEN LIGHT TOGGLES
                  689 ;
0316 CB           690         DEC     R3              ;DECREMENT LOOP COUNTER
0317 FB           691         MOV     A,R3
0318 C623         692         JZ      TMOT28          ;JUMP IF FINISHED WAITING
                  693 ;
031A 09           694         IN      A,P1
031B 999F         695         ANL     P1,#255-(EGDLT+EBDLT)   ;LIGHTS OFF
031D B211         696         JB5     TMOT22          ;JUMP IF GDLT WAS ON
                  697 ;
031F 8960         698         ORL     P1,#EGDLT+EBDLT ;LIGHTS ON
0321 6411         699         JMP     TMOT22
                  700 ;
0323 999F         701 TMOT28: ANL     P1,#255-(EGDLT+EBDLT)   ;LIGHTS OFF
                  702 ;
0325 8902         703         ORL     P1,#ENTREB      ;MOTOR ON
0327 BF05         704         MOV     R7,#5           ;SET TIMER FOR 100 MSEC
0329 FF           705 TMOT40: MOV     A,R7
032A 9629         706         JNZ     TMOT40          ;WAIT FOR MOTOR CIRCUIT TO POWER UP
                  707 ;
032C 0A           708         IN      A,P2
032D B246         709         JB5     TMOT90          ;JUMP IF ALREADY UP2SPD ... FAILED
                  710 ;
                  711 ;  WAIT 30 SECONDS FOR THE MOTOR TO GET UP2SPD.  FLASH GREEN LIGHT.
032F BBFA         712 TMOT50: MOV     R3,#250         ;SET LOOP COUNTER
0331 BF06         713 TMOT60: MOV     R7,#6           ;SET TIMER FOR 120 MSEC
0333              714 TMOT80  EQU     $
                  715 ;       CALL    CK4MRS          ;CHECK FOR MORSE CONTROL BYTE (NOT IMPLEMENTED)
0333 FF           716         MOV     A,R7            ;20MS*6*250=30SEC
0334 9633         717         JNZ     TMOT80          ;WAIT BETWEEN LIGHT TOGGLES
                  718 ;
0336 0A           719         IN      A,P2
0337 B248         720         JB5     TMOT95          ;JUMP IF MOTOR IS UP2SPD ... PASSED
                  721 ;
0339 CB           722         DEC     R3              ;DECREMENT LOOP COUNTER
033A FB           723         MOV     A,R3
033B C646         724         JZ      TMOT90          ;JUMP IF TIMED OUT ... FAILED
                  725 ;
033D 09           726         IN      A,P1            ;TOGGLE GDLT WHILE WAITING FOR UP2SPD
033E 99DF         727         ANL     P1,#255-EGDLT   ;GDLT OFF
0340 B231         728         JB5     TMOT60          ;JUMP IF GDLT WAS ON
                  729 ;
0342 8920         730         ORL     P1,#EGDLT       ;GDLT ON
0344 6431         731         JMP     TMOT60          ;CONTINUE WAITING FOR UP2SPD
                  732 ;
                  733 ;  COME HERE IF THE TEST FAILED
0346 99FD         734 TMOT90: ANL     P1,#255-ENTREB  ;MOTOR OFF
0348 27           735         CLR     A
0349 37           736         CPL     A               ;SET FAILED FLAG
034A 83           737         RET
                  738 ;
                  739 ;  COME HERE IS THE TEST PASSED
034B 27           740 TMOT95: CLR     A               ;SET PASSED FLAG
034C 83           741         RET
                  742 $       INCLUDE(:F1:TPONSL.SRC)
                  743 ;*******************************************************************************
                  744 ;  FILE:  TPONSL.SRC  4-16-87 DREW TAUSSIG
                  745 ;  FUNCTION:  PERFORM SELF-TESTS FOR 750SL
                  746 ;
0340 2400         747 TPON:   JMP     TRONSM
034F C655         748 TRORET: JZ      TPON20          ;JUMP IF THE CHECKSUM PASSED
0351 B800         749         MOV     R0,#0           ;NO BEEPS WITH THIS ERROR
0353 6478         750         JMP     TPON90
                  751 ;
```

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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   11
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

 0357 C650       = 753 TRARET: JZ      TPON30          ;JUMP IF THE RAM TEST PASSED
 0359 B801       = 754         MOV     R0,#1           ;ONE BEEP FOR THIS ERROR
 035B 6478       = 755         JMP     TPON90
                 = 756 ;
 035D F5         = 757 TPON30: SEL     RB1
 035E 3400       = 758         CALL    RCOMM           ;GET CHECKSUM BYTE FROM SUPER8
 0360 E5         = 759         SEL     RB0
 0361 C667       = 760         JZ      TPON40          ;VALID CHKSUM SETS A TO 0
 0363 B805       = 761         MOV     R0,#5           ;5 BEEPS FOR I/F ROM CHECKSUM ERROR
 0365 6478       = 762         JMP     TPON90
                 = 763 ;
 0367 440E       = 764 TPON40: JMP     TTAG
 0369 99FC       = 765 TTARET: ANL     P1,#255-(ETEST+ETMARK)  ;CLEAR TEST AND TEST MARK LINES
 036B C671       = 766         JZ      TPON50          ;JUMP IF THE TTAG TEST PASSED
 036D B803       = 767         MOV     R0,#3           ;THREE BEEPS FOR THIS ERROR
 036F 6478       = 768         JMP     TPON90
                 = 769 ;
 0371 7600       = 770 TPON50: CALL    TMOTOR
 0373 C679       = 771         JZ      TPON60          ;JUMP IF THE MOTOR TEST PASSED
 0375 B804       = 772         MOV     R0,#4           ;FOUR BEEPS FOR THIS ERROR
 0377 6478       = 773         JMP     TPON90
                 = 774 ;
 0379 6482       = 775 TPON60: JMP     TPORET          ;RETURN FROM THE POWER UP TESTS
                 = 776 ;
 037B 747F       = 777 TPON90: CALL    TERRUT          ;ERRORS COME HERE
 037D 0400       = 778         JMP     RSTTRP          ;RESTART THE PROGRAM
                 = 779 ;*****************************************************************
                 = 780 ;  ROUTINE:  TERRUT  6-17-86 16:25  BOB ACTIS
                 = 781 ;  FUNCTION:  SELFTEST ERROR ROUTINE
                 = 782 ;             BEEP R0 TIMES AND WAIT 1 SECOND
                 = 783 ;  ENTRY:  R0 = NUMBER OF BEEPS
                 = 784 ;  EXIT:  USES R0, R7
                 = 785 ;
 037F 990F       = 786 TERRUT: ANL     P1,#255-EGDLT   ;GDLT OFF
 0381 8940       = 787         ORL     P1,#EBDLT       ;BDLT ON
                 = 788 ;
 0383 55         = 789         STRT    T
 0384 25         = 790         EN      TCNTI           ;ENABLE THE TIMER OPERATION
                 = 791 ;
 0385 F8         = 792 TERR02: MOV     A,R0
 0386 C698       = 793         JZ      TERR10          ;JUMP IF NO BEEPS
                 = 794 ;
 0388 D5         = 795 TERR04: SEL     RB1
 0389 BD28       = 796         MOV     R5,#ETONCT      ;SET THE TONE CYCLE COUNTER
 038B BE02       = 797         MOV     R6,#2           ;SET BEEP TIMER FOR 40 MSEC
 038D FE         = 798 TERR06: MOV     A,R6
 038E 968D       = 799         JNZ     TERR06          ;WAIT FOR BEEP TO END
 0390 C5         = 800         SEL     RB0
                 = 801 ;
 0391 BF03       = 802         MOV     R7,#3           ;SET TIMER FOR 60 MSEC
 0393 FF         = 803 TERR08: MOV     A,R7
 0394 9693       = 804         JNZ     TERR08          ;WAIT BETWEEN BEEPS
                 = 805 ;
 0396 E888       = 806         DJNZ    R0,TERR04       ;BEEP LOOP
                 = 807 ;
 0398 BF32       = 808 TERR10: MOV     R7,#E1000M      ;SET TIMER FOR 1 SECOND
 039A FF         = 809 TERR12: MOV     A,R7
 039B 969A       = 810         JNZ     TERR12
                 = 811 ;
 039D 83         = 812         RET
                   813 $       INCLUDE(:F1:FPOWUP.SRC)
;*****************************************
TROPG3: MOVP    A,@A
        RET
        ORG     400H
$       INCLUDE(:F1:MO                  = 814 ;*****************************************************************************
                = 815 ;  FILE:  FPOWUP.SRC  12-09-86 13:50  BOB ACTIS
                = 816 ;  ROUTINE: POWUP
                = 817 ;  FUNCTION:  INITIALIZE SYSTEM
                = 818 ;
 039E 93        = 819 POWOO:  RETR                    ;RESET THE IIP FLIP-FLOP
 039F           = 820 POWUP   EQU     $
 039F 15        = 821         DIS     I
 03A0 35        = 822         DIS     TCNTI
 03A1 27        = 823         CLR     A
 03A2 D7        = 824         MOV     PSW,A
```

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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   13
GNAD95 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                   = 903 ; BYTE DEFINITION
                   = 904 ;
                   = 905 ; TEST CONTROL BYTE = D1H
                   = 906 ; THHDR = COUNT HEADER BYTE = 15H (AFTER PARITY INSERT = 95H)
                   = 907 ; THTRLR = COUNT TRAILER BYTE = 2AH (AFTER PARITY INSERT = 6AH)
                   = 908 ;
0400 B5            = 909 TH000:  CLR     F0        ;F0 INDICATES CONTROL BYTE RECEIVED IF ON
0401 A5            = 910         CLR     F1        ;F1 ON INDICATES CDD BYTE RECEIVED
0402 B830          = 911         MOV     R0,#TSEG1 ;R0=SEG TABLE POINTER
0404 BB10          = 912         MOV     R3,#16    ;R3=LOOP COUNTER TO RECEIVE 16 DATA CHAR'S
0406 999F          = 913         ANL     P1,#255-(EGDLT+EBDLT)   ;LIGHTS OFF
0408 8910          = 914         ORL     P1,#ELASDB        ;LASER OFF
040A 860E          = 915 TH005:  JNI     TH010     ;JMP IF FCA HAS DATA
040C 840A          = 916         JMP     TH005
                   = 917 ;
                   = 918 ;       FETCH DATA FROM FCA, DO FRAME RESET TO FCA, FETCH COMM DATA
                   = 919 ;       IF BIT 7 SET, JMP TO POWER UP RESET IF COMM DATA=0.
                   = 920 ;
040E B901          = 921 TH010:  MOV     R1,#01H
0410 81            = 922         MOVX    A,@R1     ;READ FCA S.R.
0411 91            = 923         MOVX    @R1,A     ;DO FCA FRAME RESET
0412 37            = 924         CPL     A
0413 F20A          = 925         JB7     TH005     ;RETURN IF FCA DOES NOT HAVE COMMM DATA
                   = 926 ;
                   = 927 ;       OTHERWISE, FETCH COMM DATA
                   = 928 ;
0415 19            = 929         INC     R1        ;TO 02H TO READ COMM REG
0416 81            = 930         MOVX    A,@R1     ;READ FCA COMM REG
0417 A9            = 931         MOV     R1,A      ;R1=COMM DATA
0418 961C          = 932         JNZ     TH014     ;JMP IF DATA NOT=0
041A 0400          = 933 TH012:  JMP     RSTTRP    ;JMP TO POWER UP RESET IF COMM DATA=0
                   = 934 ;
041C 840E          = 935 TH014:  CALL    CPARTY    ;CPARTY WILL CHK FOR CORRECT PARITY
041E 17            = 936         INC     A
041F 9600          = 937         JNZ     TH000     ;JMP BACK TO START IF INCORRECT PARITY
0421 F9            = 938         MOV     A,R1      ;R1=COMM DATA
0422 862D          = 939         JF0     TH015     ;JMP IF CONTROL BYTE ALREADY RECEIVED
                   = 940                           ;OTHERWISE, CHECK FOR CONTROL BYTE=D1H
0424 D3D1          = 941         XRL     A,#0D1H
0426 9600          = 942         JNZ     TH000     ;JMP BACK TO START IF NOT CONTROL BYTE
0428 95            = 943         CPL     F0        ;SET F0=1 TO INDICATE CONTROL BYTE RCVD
0429 B940          = 944         ORL     P1,#EBDLT ;BD-LT ON SAYS CNTL BYTE RCVD
042B 840A          = 945         JMP     TH005     ;BACK TO TH005 TO GET 16 DATA BYTES
                   = 946 ;
                   = 947 ;       PUT EVEN BYTES IN HIGH NIBBLE & CDD BYTES IN LOW NIBBLE
                   = 948 ;
042D F9            = 949 TH015:  MOV     A,R1      ;R1=COMM DATA
042E 7634          = 950         JF1     TH020     ;JMP IF THIS IS CDD BYTE
0430 47            = 951         SWAP    A
0431 A0            = 952         MOV     @R0,A     ;PUT EVEN BYTE IN HIGH NIBBLE
0432 8436          = 953         JMP     TH029
0434 30            = 954 TH020:  XCHD    A,@R0     ;PUT CDD BYTE IN LOW NIBBLE
0435 18            = 955         INC     R0        ;INC R0 TO NEXT SEG TABLE ADDRESS
                   = 956 ;
                   = 957 ; CHECK FOR LAST BYTE OF CONTROL BYTE
                   = 958 ;
0436 B5            = 959 TH029:  CPL     F1
0437 F9            = 960         MOV     A,R1
0438 9200          = 961         JB4     TH000             ;JMP = CONTROL BYTE
043A 8240          = 962         JB5     TH030             ;JMP = LAST BYTE RCVD
043C EB0A          = 963         DJNZ    R3,TH005          ;JMP = MORE TO COME
043E 8400          = 964         JMP     TH000
                   = 965 ;
                   = 966 ; IF 16 BYTES RECEIVED, PERFORM TEST
                   = 967 ;
0440 EB00          = 968 TH030:  DJNZ    R3,TH000          ;JMP = NOT 16 BYTES
0442 9462          = 969         CALL    TSCNT             ;GO COLLECT SEGMENTS
                   = 970 ;
                   = 971 ; SEND HEADER, COUNTS AND LAST BYTE TO COMPUTER
                   = 972 ;
0444 B915          = 973         MOV     R1,#15H           ;SEND COUNT HEADER BYTE TO HOST
0446 8400          = 974         CALL    THSND             ;SEND HEADER
                   = 975 ;
0448 BB08          = 976         MOV     R3,#8
044A B838          = 977         MOV     R0,#TCNT1         ;R0=COUNT PONTER
044C F8            = 978 TH050:  MOV     A,R3
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   14
GHA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

 044F F0          = 980          MOV     A,@R0
 0450 47          = 981          SWAP    A
 0451 8455        = 982          JMP     TMO59
 0453 30          = 983 TMO55:   XCHD    A,@R0
 0454 18          = 984          INC     R0
 0455 530F        = 985 TMO59:   ANL     A,#0FH
 0457 A9          = 986          MOV     R1,A
 0458 B400        = 987          CALL    TMSND
 045A EB4C        = 988          DJNZ    R3,TMO50
                  = 989 ;
 045C B92A        = 990          MOV     R1,#2AH         ;2AH = COUNT TRAILER BYTE
 045E B400        = 991          CALL    TMSND           ;SEND TRAILER BYTE
 0460 8400        = 992          JMP     TM000   ;FINISHED WITH THIS REQUEST, START OVER.
                    993 $        INCLUDE(:F1:MORSE2.SRC)
                  = 994 ;*****************************************************************
                  = 995 ;  FILE:  MORSE2.SRC  MORSE TEST PART 2 OF 3.
                  = 996 ;  07-03-86 10:35 BOB ACTIS
                  = 997 ;
                  = 998 ; ROUTINE: TSCNT - COUNT TEST SEGMENTS
                  = 999 ;
                 =1000 ; FUNCTION: COUNT THE NUMBER OF TIMES EACH OF TWO SEGMENTS ARE DETECTED
                 =1001 ;       OVER A ONE SECOND PERIOD.  TURN THE LASER ON DURING THE TEST.
                 =1002 ;       EXIT TO POWER ON ENTRY IF ANYTHING RECEIVED FROM HOST.
                 =1003 ;       WILL COMPARE 1ST 2 CHAR'S OF SEGMENT CAPTURED WITH
                 =1004 ;       TSEG1 & TSEG2 AND RESET FCA SHIFT REG IF NO COMPARE.
                 =1005 ;       4 CHAR SEG'S MUST BE PRECEDED BY 00H IN THE SEG TABLE...
                 =1006 ;
                 =1007 ; ENTRY:
                 =1008 ;       TSEG1 = SEGMENT 1 DEFINITION  (4 BYTES)
                 =1009 ;       TSEG2 = SEGMENT 2 DEFINITION  (4 BYTES)
                 =1010 ;
                 =1011 ; EXIT:
                 =1012 ;       TCNT1 = SEGMENT 1 COUNT (2 BYTES)
                 =1013 ;       TCNT2 = SEGMENT 2 COUNT (2 BYTES)
                 =1014 ;
                 =1015 ; *( A)
                 =1016 ; *(R0)
                 =1017 ; *(R1)
                 =1018 ; *(TSCBUF) TO (TSCBUF+3)
                 =1019 ;  R80 (R7) = SECOND TIMER = 0
                 =1020 ;
                 =1021 ; PARAMETERS:
                 =1022 ;
                 =1023 ;       SEGMENT DEFINITION TABLE
                 =1024 ;
                 =1025 ;       BYTE 0 - 1ST AND 2ND CHAR (AS DETECTED OR ZERO IF 4-CHAR)
                 =1026 ;       BYTE 1 - 3RD AND 4TH CHAR (1ST & 2ND ON 4-CHAR)
                 =1027 ;       BYTE 2 - 5TH AND 6TH CHAR (3RD & 4TH ON 4-CHAR)
                 =1028 ;       BYTE 3 - DECODED PARITY WORD
                 =1029 ;
 0462 99EF       =1030 TSCNT:  ANL     P1,#0FFH-ELASDB ;LASER ON
 0464 BF02       =1031         MOV     R7,#02H
 0466 8438       =1032         CALL    TMWAIT          ;WAIT FOR LASER TO TURN ON
 0468 BF32       =1033         MOV     R7,#E1000H
 046A 27         =1034         CLR     A
 046B B838       =1035         MOV     R0,#TCNT1
 046D B909       =1036         MOV     R1,#9
 046F A0         =1037 TSC02:  MOV     @R0,A           ;CLEAR TCNT1 TO TCNT1+9
 0470 18         =1038         INC     R0
 0471 E96F       =1039         DJNZ    R1,TSC02
                 =1040 ;
                 =1041 ; RESET FCA TO CLEAR ANY SEGMENTS
                 =1042 ;
 0473 B803       =1043         MOV     R0,#EFCRST
 0475 90         =1044         MOVX    @R0,A
                 =1045 ;
                 =1046 ; IF SYNCAP THEN READ THE SEGMENT; EXIT IF HOST BYTE RECEIVED.
                 =1047 ;
 0476 A5         =1048 TSC04:  CLR     F1              ;F1 REMEMBERS TO INC TCNT1 OR TCNT2
 0477 B801       =1049         MOV     R0,#ESRRD
 0479 B68D       =1050 TSC05:  JNI     TSC08           ;JMP IF SYNCAP OR HOST COMM. OCCURED
 047B FF         =1051 TSC06:  MOV     A,R7            ;CHECK FOR 1 SECOND TIMEOUT
 047C 9676       =1052         JNZ     TSC04
                 =1053 ;
                 =1054 ;       TURN LASER OFF & RETURN TO CALLER
                 =1055 ;
```

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ISIS-II MCS-48/UP1-41 MACRO ASSEMBLER, V4.2                    PAGE  15
GHA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

 0480 83           =1057        RET
                   =1058 ;
 0481 90           =1059 TSC07: MOVX  @R0,A          ;RESET FCA SHIFT REG
 0482 8478         =1060        JMP   TSC06
                   =1061 ;
 0484 80           =1062 TSC12: MOVX  A,@R0          ;SHIFT OUT 2ND CHAR FROM FCA
 0485 27           =1063        CLR   A
 0486 B950         =1064        MOV   R1,#TSCBUF
 0488 A1           =1065        MOV   @R1,A          ;PUT 00 TO R4 FOR 1ST TWO CHAR'S
 0489 8499         =1066        JMP   TSC09
 048B 0400         =1067 TSC11: JMP   RSTTRP
 048D B950         =1068 TSC08: MOV   R1,#TSCBUF     ;START OF DATA CAPTURE BUFFER
 048F 80           =1069        MOVX  A,@R0          ;READ 1ST CHAR FROM FCA
 0490 F288         =1070        JB7   TSC11          ;JMP TO POWER UP SEQ IF COMM. FROM HOST
 0492 9284         =1071        JB4   TSC12          ;JMP IF 4 CHAR SEQ...1ST 2 CHARS=00
 0494 47           =1072        SWAP  A
 0495 A1           =1073        MOV   @R1,A
 0496 80           =1074        MOVX  A,@R0          ;READ 2ND CHAR FROM FCA
 0497 31           =1075        XCHD  A,@R1
 0498 F1           =1076        MOV   A,@R1
 0499 B930         =1077 TSC09: MOV   R1,#TSEG1
 049B D1           =1078        XRL   A,@R1          ;COMPARE 1ST 2 CHAR'S WITH TSEG1
 049C C6A6         =1079        JZ    TSC10          ;JMP IF COMPARED
 049E B934         =1080        MOV   R1,#TSEG2
 04A0 F1           =1081        MOV   A,@R1
 04A1 B950         =1082        MOV   R1,#TSCBUF
 04A3 D1           =1083        XRL   A,@R1          ;COMPARE 1ST 2 CHAR'S WITH TSEG2
 04A4 9681         =1084        JNZ   TSC07          ;JMP TO RESET FCA S.R. IF NO COMPARE
                   =1085 ;
 04A6 B951         =1086 TSC10: MOV   R1,#TSCBUF+1   ;SET UP TO READ NEXT 4 CHAR'S
 04A8 8416         =1087        CALL  NEXT4          ;READ 3RD-6TH CHAR'S
                   =1088 ;
 04AA B831         =1089        MOV   R0,#TSEG1+1    ;COMPARE COMPLETE SEG TO TSEG1 & 2
 04AC 842A         =1090        CALL  SCMTCH         ;COMPARE LAST 4 CHAR'S OF CAPTURED SEG
                   =1091                             ;TO TSEG1
 04AE C6B8         =1092        JZ    SEGONE         ;JMP IF SEG 1 COMPARED
 04B0 B5           =1093        CPL   F1             ;F1=1 SAYS TSEG2 BEING COMPARED
 04B1 B835         =1094        MOV   R0,#TSEG2+1
 04B3 842A         =1095        CALL  SCMTCH
 04B5 967B         =1096        JNZ   TSC06          ;JMP IF NO MATCH
 04B7 B838         =1097        MOV   R0,#TCNT2+1
 04B9 76B0         =1098        JF1   INCREM         ;JMP IF TSEG 2 MATCHED TO INCREMENT
 04BB B839         =1099 SEGONE: MOV   R0,#TCNT1+1    ;SET UP R0 TO INCREMENT TSEG 1 CNTR
 04BD 17           =1100 INCREM: INC   A              ;ACC NOW = 01
 04BE 60           =1101        ADD   A,@R0          ;INC LOW BYTE
 04BF A0           =1102        MOV   @R0,A
 04C0 C8           =1103        DEC   R0
 04C1 27           =1104        CLR   A
 04C2 70           =1105        ADDC  A,@R0          ;INC HIGH BYTE IF CARRY
 04C3 A0           =1106        MOV   @R0,A
 04C4 8478         =1107        JMP   TSC06          ;JMP TO CHK FOR 1 SECOND TIMEOUT
                    1108 ;*************************************
 04C6 A3           1109 TROPGC? MOVP  A,@A
 04C7 83           1110         RET
 0500              1111         ORG   500H
                   1112 $       INCLUDE(:F1:HORSE3.SRC)
                  =1113 ;*****************************************************************************
                  =1114 ;  FILE:  HORSE3.SRC  HORSE TEST FILE 3 OF 3.
                  =1115 ;  07-03-86 09:30 BOB ACTIS
                  =1116 ;*****************************************************************************
                  =1117 ; ROUTINE: TRSMD
                  =1118 ;
                  =1119 ; FUNCTION: SEND A BYTE TO HOST. WAITS FOR TRANSMITTER READY.
                  =1120 ;
                  =1121 ; ENTRY:
                  =1122 ;       (R1) = BYTE TO SEND (NO PARITY)
                  =1123 ;
                  =1124 ; EXIT:
                  =1125 ;       *(A)
                  =1126 ;       *(R1)
                  =1127 ;       *(R4)
                  =1128 ;
 0500 0A          =1129 TRSMD: IN    A,P2
 0501 9200        =1130        JB4   TRSMD          ;JMP = HOST COMM. REG. NOT READY
 0503 F9          =1131        MOV   A,R1           ;(A) = BYTE
 0504 840E        =1132        CALL  CPARTY
```

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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   16
GHAD95 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

 0507 53C0      =1134          ANL     A,#0C0H
 0509 49        =1135          ORL     A,R1            ;(A) = FINAL BYTE WITH PARITY
 050A B902      =1136          MOV     R1,#EOCIA
 050C 91        =1137          MOVX    @R1,A
 050D 83        =1138          RET
                =1139 ;*************************************************************************
                =1140 ; ROUTINE: CPARTY
                =1141 ;
                =1142 ; FUNCTION: COMPUTE PARITY OF ALTERNATE BITS OF BYTE
                =1143 ;
                =1144 ; ENTRY:
                =1145 ;       (A) = BYTE
                =1146 ;
                =1147 ; EXIT:
                =1148 ;       (A) = PARITY
                =1149 ;             B7 = B5 = B3 = B1 = PARITY OF ODD BITS
                =1150 ;             B6 = B4 = B2 = B0 = PARITY OF EVEN BITS
                =1151 ;       *(R4)
                =1152 ;
 050E AC        =1153 CPARTY: MOV     R4,A
 050F 47        =1154         SWAP    A
 0510 DC        =1155         XRL     A,R4
 0511 AC        =1156         MOV     R4,A
 0512 E7        =1157         RL      A
 0513 E7        =1158         RL      A
 0514 DC        =1159         XRL     A,R4
 0515 83        =1160         RET
                =1161 ;*************************************************************************
                =1162 ;  NEXT4:  READ 3RD-6TH CHARACTERS
                =1163 ;
 0516 80        =1164 NEXT4:  MOVX    A,@R0           ;READ 3RD CHAR FROM LSI3
 0517 47        =1165         SWAP    A
 0518 A1        =1166         MOV     @R1,A           ;PUT 3RD TO HI NIB. OF TSCBUF+1
 0519 80        =1167         MOVX    A,@R0           ;READ 4TH CHAR
 051A 31        =1168         XCHD    A,@R1           ;PUT 4TH TO LO TSCBUF+1
 051B 19        =1169         INC     R1              ;POINTS TO TSCBUF+2 NOW
 051C 80        =1170         MOVX    A,@R0           ;READ 5TH CHAR
 051D 47        =1171         SWAP    A
 051E A1        =1172         MOV     @R1,A           ;PUT 5TH TO HI TSCBUF+2
 051F 80        =1173         MOVX    A,@R0           ;READ 6TH CHAR
 0520 31        =1174         XCHD    A,@R1           ;PUT 6TH TO LO TSCBUF+2
 0521 19        =1175         INC     R1
 0522 B804      =1176         MOV     R0,#04H
 0524 80        =1177         MOVX    A,@R0           ;R0=04H,@R0=PARITY DECODE READ OF LSI3
 0525 A1        =1178         MOV     @R1,A           ;PUT PARITY DECODE TO TSCBUF+3
 0526 B801      =1179         MOV     R0,#01H
 0528 90        =1180         MOVX    @R0,A           ;FR.RST TO LSI 3
 0529 83        =1181         RET
                =1182 ;*************************************************************************
                =1183 ; ROUTINE: SCNTCH - MATCH SEGMENTS
                =1184 ;
                =1185 ; FUNCTION: DETERMINE IF TWO SEGMENTS HAVE IDENTICAL DATA AND PARITY
                =1186 ;                 (LAST 4 CHARACTERS OF SEG AND PARITY)
                =1187 ;
                =1188 ; ENTRY:
                =1189 ;       (R0) = ADRS OF ONE SEGMENT - SAME FORMAT AS REG 4-7
                =1190 ;       (TSCBUF+1) = 3RD AND 4TH CHAR
                =1191 ;       (TSCBUF+2) = 5TH AND 6TH CHAR
                =1192 ;       (TSCBUF+3) = DECODED PARITY WORD
                =1193 ;
                =1194 ; EXIT:
                =1195 ;       (A) = 0 FOR MATCH
                =1196 ;       *(R0)
                =1197 ;
 052A F0        =1198 SCNTCH: MOV     A,@R0
 052B B951      =1199         MOV     R1,#TSCBUF+1
 052D D1        =1200         XRL     A,@R1
 052E 963A      =1201         JNZ     SCN90           ;JMP = 2ND BYTE NO MATCH
 0530 18        =1202         INC     R0
 0531 19        =1203         INC     R1
 0532 F0        =1204         MOV     A,@R0
 0533 D1        =1205         XRL     A,@R1
 0534 963A      =1206         JNZ     SCN90           ;JMP = 3RD BYTE NO MATCH
 0536 18        =1207         INC     R0
 0537 19        =1208         INC     R1
 0538 F0        =1209         MOV     A,@R0
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   17
GHA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

 053A 83          =1211 SGN90:  RET
                  =1212 ;*****************************************************************************
                  =1213 ; ROUTINE: TMWAIT
                  =1214 ;
                  =1215 ; FUNCTION: WAIT FOR 20MSEC TIMER TO EXHAUST
                  =1216 ;
                  =1217 ; ENTRY:
                  =1218 ;       RB0 (R7) = TIMER (20MSEC RES)
                  =1219 ;
                  =1220 ; EXIT:
                  =1221 ;       RB0 (R7) = 0
                  =1222 ;
 0538 27          =1223 TMWAIT: CLR     A
 053C 62          =1224         MOV     T,A             ;CLEAR THE TIMER COUNTER
 053D 25          =1225         EN      TCNTI           ;ENABLE TIMER INTERRUPT
 053E 55          =1226         STRT    T               ;CLEAR TIMER PRESCALER
                  =1227 ;
 053F FF          =1228 TMWAIO: MOV     A,R7
 0540 963F        =1229         JNZ     TMWAIO
 0542 83          =1230         RET
                   1231 ;*************************************
 0543 A3           1232 TROPCS: MOVP    A,@A
 0544 83           1233         RET
 0600              1234         ORG     600H
                   1235 $        INCLUDE(:F1:FCXCTS.SRC)
                  =1236 ;*****************************************************************************
                  =1237 ;  FILE:  FCXCTS.SRC  10-08-86 15:45  BOB ACTIS
                  =1238 ;  ROUTINE:  CXCNTS
                  =1239 ;  FUNCTION:  CHECK SEGMENT BUFFER TOTAL COUNTS FOR ENOUGH SEGMENTS FOR
                  =1240 ;             A POSSIBLE VALID VERSION.
                  =1241 ;  ENTRY:  NO SETUP
                  =1242 ;  EXIT:  A = 0 IF ENOUGH SEGMENTS
                  =1243 ;          A <> 0 IF NOT ENOUGH SEGMENTS OR (VERSION D IF IBM-OCR I/F)
                  =1244 ;          USES R0,R1,F0
                  =1245 ;
 0600 B9FE        =1246 CXCNTS: MOV     R1,#-2          ;SETUP MINIMUM SCANS REQUIRED VALUE
                  =1247 ;
 0602 85          =1248         CLR     F0
 0603 0A          =1249         IN      A,P2
 0604 37          =1250         CPL     A
 0605 F208        =1251         JB7     CXCN05          ;JUMP IF FUJITSU I/F
 0607 95          =1252         CPL     F0              ;SET F0 IF IBM-OCR I/F
                  =1253 ;
 0608 B835        =1254 CXCN05: MOV     R0,#R6STOT
 060A F0          =1255         MOV     A,@R0
 060B 69          =1256         ADD     A,R1
 060C F622        =1257         JC      CXCN20          ;POSSIBLE UPC-A, EAN-13 OR UPC-D-BLK2
                  =1258 ;
 060E B82D        =1259         MOV     R0,#L6STOT
 0610 F0          =1260         MOV     A,@R0
 0611 69          =1261         ADD     A,R1
 0612 F62F        =1262         JC      CXCN30          ;POSSIBLE UPC-E OR UPC-D-BLK1
                  =1263 ;
 0614 B838        =1264         MOV     R0,#L4STOT
 0616 F0          =1265         MOV     A,@R0
 0617 69          =1266         ADD     A,R1
 0618 E695        =1267         JNC     CXCNNG
                  =1268 ;
 061A B841        =1269 CXCN10: MOV     R0,#R4STOT
 061C F0          =1270         MOV     A,@R0
 061D 69          =1271         ADD     A,R1
 061E F693        =1272         JC      CXCNOK          ;POSSIBLE EAN-8
 0620 C695        =1273         JMP     CXCNNG
                  =1274 ;
 0622 B82D        =1275 CXCN20: MOV     R0,#L6STOT
 0624 F0          =1276         MOV     A,@R0
 0625 69          =1277         ADD     A,R1
 0626 E695        =1278         JNC     CXCNNG
                  =1279 ;
 0628 B827        =1280         MOV     R0,#L6S1+3
 062A F0          =1281         MOV     A,@R0           ;GET THE PARITY DECODE BYTE
 062B B24F        =1282         JB5     CXCN50          ;JUMP IF UPC-D SEGMENT
 062D C693        =1283         JMP     CXCNOK          ;POSSIBLE UPC-A OR EAN-13
                  =1284 ;
 062F B827        =1285 CXCN30: MOV     R0,#L6S1+3      ;CHECK L6 BUFFER 1
 0631 F0          =1286         MOV     A,@R0
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   18
CMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

 0634 9293        =1288          JB4     CKCHOK          ;POSSIBLE UPC-E
                  =1289 ;
 0636 B828        =1290          MOV     R0,#L6S2+3      ;CHECK L6 BUFFER 2
 0638 F0          =1291          MOV     A,@R0
 0639 B23F        =1292          JB5     CKCH40          ;JUMP IF UPC-D SEGMENT
 063B 9293        =1293          JB4     CKCHOK          ;POSSIBLE UPC-E
 063D C495        =1294          JMP     CKCHNG
                  =1295 ;
 063F B865        =1296 CKCH40:  MOV     R0,#N6STOT
 0641 F0          =1297          MOV     A,@R0
 0642 69          =1298          ADD     A,R1
 0643 E695        =1299          JNC     CKCHNG
                  =1300 ;
 0645 B838        =1301 CKCH45:  MOV     R0,#L4STOT
 0647 F0          =1302          MOV     A,@R0
 0648 69          =1303          ADD     A,R1
 0649 B695        =1304          JF0     CKCHNG          ;JUMP IF IBM-OCR
 064B F693        =1305          JC      CKCHOK          ;POSSIBLE UPC-D1
 064D C495        =1306          JMP     CKCHNG
                  =1307 ;
 064F B841        =1308 CKCH50:  MOV     R0,#R4STOT
 0651 F0          =1309          MOV     A,@R0
 0652 69          =1310          ADD     A,R1
 0653 E695        =1311          JNC     CKCHNG
                  =1312 ;
 0655 B859        =1313          MOV     R0,#N4STOT
 0657 F0          =1314          MOV     A,@R0
 0658 69          =1315          ADD     A,R1
 0659 F675        =1316          JC      CKCH70          ;POSSIBLE UPC-D4 OR D5
                  =1317 ;
 065B B85F        =1318          MOV     R0,#N5STOT
 065D F0          =1319          MOV     A,@R0
 065E 69          =1320          ADD     A,R1
 065F F668        =1321          JC      CKCH60
                  =1322 ;
 0661 B840        =1323          MOV     R0,#N2STOT
 0663 F0          =1324          MOV     A,@R0
 0664 69          =1325          ADD     A,R1
 0665 B695        =1326          JF0     CKCHNG          ;JUMP IF IBM-OCR
 0667 F693        =1327          JC      CKCHOK          ;POSSIBLE UPC-D2
 0669 C495        =1328          JMP     CKCHNG
                  =1329 ;
 066B B853        =1330 CKCH60:  MOV     R0,#N3STOT
 066D F0          =1331          MOV     A,@R0
 066E 69          =1332          ADD     A,R1
 066F B695        =1333          JF0     CKCHNG          ;JUMP IF IBM-OCR
 0671 F693        =1334          JC      CKCHOK          ;POSSIBLE UPC-D3
 0673 C495        =1335          JMP     CKCHNG
                  =1336 ;
 0675 B847        =1337 CKCH70:  MOV     R0,#N1STOT
 0677 F0          =1338          MOV     A,@R0
 0678 69          =1339          ADD     A,R1
 0679 E695        =1340          JNC     CKCHNG
                  =1341 ;
 067B B865        =1342          MOV     R0,#N6STOT
 067D F0          =1343          MOV     A,@R0
 067E 69          =1344          ADD     A,R1
 067F F688        =1345          JC      CKCH80
                  =1346 ;
 0681 B85F        =1347          MOV     R0,#N5STOT
 0683 F0          =1348          MOV     A,@R0
 0684 69          =1349          ADD     A,R1
 0685 B695        =1350          JF0     CKCHNG          ;JUMP IF IBM-OCR
 0687 F693        =1351          JC      CKCHOK          ;POSSIBLE UPC-D4
 0689 C495        =1352          JMP     CKCHNG
                  =1353 ;
 068B B853        =1354 CKCH80:  MOV     R0,#N3STOT
 068D F0          =1355          MOV     A,@R0
 068E 69          =1356          ADD     A,R1
 068F B695        =1357          JF0     CKCHNG          ;JUMP IF IBM-OCR
 0691 E695        =1358          JNC     CKCHNG          ;FALL THRU POSSIBLE UPC-D5
                  =1359 ;
 0693 27          =1360 CKCHOK:  CLR     A               ;ENOUGH SCANS FOR A POSSIBLE SEGMENT
 0694 83          =1361          RET
                  =1362 ;
 0695 27          =1363 CKCHNG:  CLR     A               ;NO POSSIBLE VERSIONS YET
```

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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                    PAGE   19
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

 0697 83          =1365         RET
                   1366 $       INCLUDE(:F1:COPYRT.SRC)
                  =1367 ;*******************************************************************************
                  =1368 ;
 0698 434F5059    =1369         DB      'COPYRIGHT (C)1987 '
 069C 52494748
 06A0 54202843
 06A4 29313938
 06A8 3720
 06AA 53504543    =1370         DB      'SPECTRA-PHYSICS, INC. '
 06AE 5452412D
 06B2 50485953
 06B6 4943532C
 06BA 20494E43
 06BE 2E20
 06C0 414C4C20    =1371         DB      'ALL RIGHTS RESERVED'
 06C4 52494748
 06C8 54532052
 06CC 45534552
 06D0 564544
                  =1372 ;
                  =1373 ;*******************************************************************************
                   1374 ;*****************************************
 0603 A3           1375 TROPG6: MOVP    A,@A
 0604 83           1376         RET
 0700              1377         ORG     700H
                   1378 $       INCLUDE(:F1:DRSUMT.SRC)
                  =1379 ;*******************************************************************************
                  =1380 ;  FILE:  DRSUMT  05-28-86 11:00  BOB ACTIS
                  =1381 ;*******************************************************************************
                  =1382 ;  ROUTINE:  SUM4BY, SUM3BY, SUM2BY
                  =1383 ;  FUNCTION:  ADD 4,3 OR 2 BYTE SEGMENT DATA TO ACCUMULATOR
                  =1384 ;  ENTRY:  R0 = START ADDRESS OF SEGMENT BUFFER TO SUM
                  =1385 ;  EXIT:  R0 = END ADDRESS OF SEGMENT BUFFER
                  =1386 ;          A = RUNNING SUM (BASE 256) OF SEGMENT BUFFER DATA
                  =1387 ;
 0700 60          =1388 SUM4BY: ADD     A,@R0
 0701 18          =1389         INC     R0
 0702 60          =1390 SUM3BY: ADD     A,@R0
 0703 18          =1391         INC     R0
 0704 60          =1392 SUM2BY: ADD     A,@R0
 0705 18          =1393         INC     R0
 0706 60          =1394         ADD     A,@R0
 0707 83          =1395         RET
                  =1396 ;*******************************************************************************
                  =1397 ;  ROUTINE:  DRSUMT  DOUBLE READ SUM TEST
                  =1398 ;  FUNCTION:  CALCULATE THE LABEL DATA SUM (BASE 256)
                  =1399 ;             COMPARE IT TO THE PREVIOUS LABEL SUM
                  =1400 ;             SAVE THE NEW SUM
                  =1401 ;  ENTRY:  A VALID LABEL VERSION HAS BEEN FOUND
                  =1402 ;  EXIT:  USES R0
                  =1403 ;          LABEL DATA SUM STORED IN DRSUM
                  =1404 ;          A=0 IF OLD=NEW (CONSECUTIVE LABELS ARE THE SAME)
                  =1405 ;          A<>0 IF OLD<>NEW (CONSECUTIVE LABELS ARE DIFFERENT)
                  =1406 ;
 0708 FE          =1407 DRSUMT: MOV     A,R6            ;GET VERSION FLAG
 0709 530F        =1408         ANL     A,#0FH          ;MASK VERSION POINTER
 070B 0300        =1409         ADD     A,#0            ;SETUP CARRY FOR DA
 070D 57          =1410         DA      A
 070E 926C        =1411         JB4     DRVRNG          ;JUMP IF POINTER > 9.  ILLEGAL VERSION.
                  =1412 ;
 0710 0313        =1413         ADD     A,#LOW  DRSTBL  ;ADD OFFSET TO TABEL ADDRESS
 0712 83          =1414         JMPP    @A              ;JUMP TO VERSION ROUTINE
 0713 6C          =1415 DRSTBL: DB      LOW DRVRNG      ;NO VALID VERSION.  POINTER=0.
 0714 10          =1416         DB      LOW DRSNA
 0715 10          =1417         DB      LOW DRSN13
 0716 20          =1418         DB      LOW DRSNE
 0717 5E          =1419         DB      LOW DRSN8
 0718 42          =1420         DB      LOW DRSND1
 0719 48          =1421         DB      LOW DRSND2
 071A 39          =1422         DB      LOW DRSND3
 071B 2C          =1423         DB      LOW DRSND4
 071C 23          =1424         DB      LOW DRSND5
                  =1425 ;
 071D             =1426 DRSNA   EQU     $
 071D 27          =1427 DRSN13: CLR     A
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                    PAGE   20
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

                 =1429 ;
 0720 27         =1430 DRSME:  CLR     A
 0721 E458       =1431         JMP     DRSM7C          ;GO SUM 7 CHARACTERS
                 =1432 ;
 0723 27         =1433 DRSMD5: CLR     A
 0724 B860       =1434         MOV     R0,#N6S1
 0726 F404       =1435         CALL    SUM2BY
 0728 B84E       =1436         MOV     R0,#N3S1
 072A E42F       =1437         JMP     DRSM5X          ;GO FINISH THE D5 SUM
                 =1438 ;
 072C 27         =1439 DRSMD4: CLR     A
 072D B85A       =1440         MOV     R0,#N5S1
 072F F404       =1441 DRSM5X: CALL    SUM2BY
 0731 B854       =1442         MOV     R0,#N4S1
 0733 F404       =1443         CALL    SUM2BY
 0735 B842       =1444         MOV     R0,#N1S1
 0737 E44E       =1445         JMP     DRSM4X          ;GO FINISH THE D4 OR D5 SUM
                 =1446 ;
 0739 27         =1447 DRSMD3: CLR     A
 073A B85A       =1448         MOV     R0,#N5S1
 073C F404       =1449         CALL    SUM2BY
 073E B84E       =1450         MOV     R0,#N3S1
 0740 E44E       =1451         JMP     DRSM3X          ;GO FINISH THE D3 SUM
                 =1452 ;
 0742 27         =1453 DRSMD1: CLR     A
 0743 B860       =1454         MOV     R0,#N6S1
 0745 F404       =1455         CALL    SUM2BY
 0747 B836       =1456         MOV     R0,#L4S1
 0749 E456       =1457         JMP     DRSM1X          ;GO FINISH THE D1 SUM
                 =1458 ;
 0748 27         =1459 DRSMD2: CLR     A
 074C B848       =1460         MOV     R0,#N2S1
 074E            =1461 DRSM3X  EQU     $
 074E F404       =1462 DRSM4X: CALL    SUM2BY
 0750 B83C       =1463         MOV     R0,#R4S1
 0752 F404       =1464         CALL    SUM2BY
 0754 B82E       =1465 DRSM7B: MOV     R0,#R6S1        ;SUM 7 BYTES
 0756 F402       =1466 DRSM1X: CALL    SUM3BY
 0758 B824       =1467 DRSM7C: MOV     R0,#L6S1        ;SUM 7 CHARACTERS
 075A F400       =1468         CALL    SUM4BY
 075C E467       =1469         JMP     DRSMDN          ;JUMP - THE SUM IS FINISHED
                 =1470 ;
 075E 27         =1471 DRSM8:  CLR     A
 075F B836       =1472         MOV     R0,#L4S1
 0761 F404       =1473         CALL    SUM2BY
 0763 B83C       =1474         MOV     R0,#R4S1
 0765 F404       =1475         CALL    SUM2BY
                 =1476 ;
 0767 B87C       =1477 DRSMDN: MOV     R0,#DRSUM
 0769 20         =1478         XCH     A,@R0           ;SAVE THE NEW SUM IN DRSUM
 076A D0         =1479         XRL     A,@R0           ;COMPARE THE OLD AND NEW SUM
 076B 83         =1480         RET
                 =1481 ;
 076C 27         =1482 DRVRNG: CLR     A               ;DOUBLE READ VERSION H/G
 076D 83         =1483         RET
                  1484 ;*****************************************
 076E A3          1485 TROPG7: MOVP    A,@A
 076F 83          1486         RET
 0800             1487         ORG     800H            ;START OF MEMORY BANK 1
                  1488 $       INCLUDE(:F1:VERDLB.SRC)
                 =1489 ;*****************************************************************
                 =1490 ;  FILE:  VERDLB.SRC  6-17-86 17:15  BOB ACTIS
                 =1491 ;         VERSION "D" FIRMWARE LIBRARY.
                 =1492 ;*****************************************************************
                 =1493 ;  ROUTINE:  CLR6SG
                 =1494 ;  FUNCTION:  CLEAR 6-CHAR SEGMENTS AND COUNTERS.
                 =1495 ;  ENTRY:  START ADDRESS AND COUNT IN DEFS TABLE.
                 =1496 ;  EXIT:   A=0
                 =1497 ;         R0 = END OF 6-CHAR BUFFER/COUNTER SPACE PLUS 1.
                 =1498 ;         R2 = 0
                 =1499 ;         6-CHAR BUFFER/COUNTER SPACE = 0'S.
                 =1500 ;
 0800 B824       =1501 CLR6SG: MOV     R0,#BF6CST      ;START OF 6-CHAR BUFFER AREA
 0802 BA12       =1502         MOV     R2,#BF6CNT      ;NUMBER OF BYTES IN BUFFER
 0804 0410       =1503         JMP     CLRT00          ;JUMP TO THE CLEAR LOOP
                 =1504 ;*****************************************************************
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   21
GNA09S ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                  =1506 ;  FUNCTION:  CLEAR 4-CHAR SEGMENTS AND COUNTERS.
                  =1507 ;  ENTRY:  START ADDRESS AND COUNT IN DEFS TABLE.
                  =1508 ;  EXIT:   A = 0
                  =1509 ;          R0 = END OF 4-CHAR BUFFER/COUNTER SPACE PLUS 1.
                  =1510 ;          R2 = 0
                  =1511 ;          4-CHAR BUFFER/COUNTER SPACE = 0'S.
                  =1512 ;
0806 8836         =1513 CLR4SG: MOV     R0,#BF4CST      ;START OF 4-CHAR BUFFER AREA
0808 8A30         =1514         MOV     R2,#BF4CNT      ;NUMBER OF BYTES IN BUFFER
080A 0410         =1515         JMP     CLRT00          ;JUMP TO THE CLEAR LOOP
                  =1516 ;*****************************************************************************
                  =1517 ;  ROUTINE:  CLRSNB
                  =1518 ;  FUNCTION:  CLEAR THE SCAN BUFFER.
                  =1519 ;  ENTRY:  START ADDRESS IN DEFS TABLE.
                  =1520 ;  EXIT:   A = 0
                  =1521 ;          R0 = END OF SCAN BUFFER SPACE PLUS 1.
                  =1522 ;          R2 = 0
                  =1523 ;          SCAN BUFFER SPACE = 0'S.
                  =1524 ;
080C 8820         =1525 CLRSNB: MOV     R0,#SCNBUF      ;START OF SCAN BUFFER AREA
080E 8A04         =1526         MOV     R2,#4           ;NUMBER OF BYTES IN BUFFER
0810 27           =1527 CLRT00: CLR     A               ;CLEAR LOOP USED BY OTHER ROUTINES
0811 A0           =1528 CLRSN1: MOV     @R0,A
0812 18           =1529         INC     R0
0813 EA11         =1530         DJNZ    R2,CLRSN1
0815 83           =1531         RET
                  =1532 ;*****************************************************************************
                  =1533 ;  ROUTINE:  CLRSBF
                  =1534 ;  FUNCTION:  CLEAR SEND BUFFER, POINTER AND FLAG.
                  =1535 ;  ENTRY:  START ADDRESS AND COUNT IN DEFS TABLE.
                  =1536 ;          RB0
                  =1537 ;  EXIT:   A = 0
                  =1538 ;          R0 = END OF SEND BUFFER SPACE PLUS 1.
                  =1539 ;          R2 = 0
                  =1540 ;          SEND BUFFER SPACE = 0CCH'S. (TERMINATION BYTES)
                  =1541 ;          SEND BUFFER FULL FLAG CLEAR.  RB0-R4-83
                  =1542 ;          SEND BUFFER POINTER SET TO PACKED DATA START ADDRESS.
                  =1543 ;
0816 FC           =1544 CLRSBF: MOV     A,R4
0817 53F7         =1545         ANL     A,#255-ESBFUL   ;CLEAR SEND BUFFER FULL FLAG
0819 AC           =1546         MOV     R4,A
                  =1547 ;
081A 8866         =1548         MOV     R0,#SBFPNT
081C B0CE         =1549         MOV     @R0,#SBSTRT     ;SET POINTER TO PACKED START ADDRESS
                  =1550 ;
081E 8867         =1551         MOV     R0,#SBUF        ;START OF SEND BUFFER AREA
0820 8A12         =1552         MOV     R2,#SBUFSZ      ;NUMBER OF BYTES IN BUFFER
0822 23CC         =1553         MOV     A,#0CCH         ;LOAD TERMINATION BYTES
0824 0411         =1554         JMP     CLRSN1          ;JUMP TO THE CLEAR LOOP
                  =1555 ;*****************************************************************************
                  =1556 ;  ROUTINE:  MOV2BY, MOV3BY, MOV4BY
                  =1557 ;  FUNCTION: MOVE BYTES FROM ONE BUFFER TO ANOTHER BUFFER.
                  =1558 ;  ENTRY:  R0 = FIRST BYTE ADDRESS OF SOURCE BUFFER.
                  =1559 ;          R1 = FIRST AVAILABLE BYTE ADDRESS OF DESTINATION BUFFER.
                  =1560 ;  EXIT:  DATA MOVED FROM SOURCE BUFFER TO DESTINATION BUFFER.
                  =1561 ;          R0 = END OF SOURCE BUFFER ADDRESS PLUS 1.
                  =1562 ;          R1 = NEXT AVAILABLE BYTE ADDRESS OF DESTINATION BUFFER.
                  =1563 ;          R2 = 0
                  =1564 ;           A = LAST BYTE TRANSFERED
                  =1565 ;
0826 8A02         =1566 MOV2BY: MOV     R2,#2
0828 0430         =1567         JMP     MOVXBY
082A 8A03         =1568 MOV3BY: MOV     R2,#3
082C 0430         =1569         JMP     MOVXBY
082E 8A04         =1570 MOV4BY: MOV     R2,#4
0830 F0           =1571 MOVXBY: MOV     A,@R0
0831 A1           =1572         MOV     @R1,A
0832 18           =1573         INC     R0
0833 19           =1574         INC     R1
0834 EA30         =1575         DJNZ    R2,MOVXBY
0836 83           =1576         RET
                  =1577 ;*****************************************************************************
                  =1578 ;  ROUTINE:  SGSUM4, SGSUM6
                  =1579 ;  FUNCTION:  SUM THE DIGITS OF A SEGMENT FOR THE MOD-10 TEST.
                  =1580 ;             ALL ARITHMETIC IS ASSUMED BCD AND ONLY THE UNITS DIGIT
                  =1581 ;             IS VALID IN THE SUMS.
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   22
GNA09S ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                   =1583 ;  EXIT:  R0 = NOT CHANGED
                   =1584 ;         R2 = C1+C3+C5   [C1+C3]
                   =1585 ;          A = C2+C4+C6   [C2+C4]
                   =1586 ;         F0 IS USED
                   =1587 ;
 0837 85           =1588 SGSUM4: CLR     F0
 0838 95           =1589         CPL     F0              ;SET F0 FOR 4-CHAR SUM
 0839 043C         =1590         JMP     SGSUMX
                   =1591 ;
 083B 85           =1592 SGSUM6: CLR     F0              ;CLEAR F0 FOR 6-CHAR SUM
 083C BAF0         =1593 SGSUMX: MOV     R2,#0F0H        ;MASK FOR ODD DIGITS
 083E F0           =1594         MOV     A,@R0           ;C1
 083F 5A           =1595         ANL     A,R2
 0840 18           =1596         INC     R0
 0841 60           =1597         ADD     A,@R0           ;C1+C3
 0842 57           =1598         DA      A
 0843 5A           =1599         ANL     A,R2
 0844 B649         =1600         JF0     SGSUMY          ;JUMP IF 4-CHAR SUM
                   =1601 ;
 0846 18           =1602         INC     R0
 0847 60           =1603         ADD     A,@R0           ;C1+C3+C5
 0848 57           =1604         DA      A
 0849 47           =1605 SGSUMY: SWAP    A               ;PUT SUM IN LOW BYTE
 084A AA           =1606         MOV     R2,A            ;SAVE C1+C3+C5  [C1+C3]
                   =1607 ;
 084B F0           =1608         MOV     A,@R0           ;C6  [C4]
 084C C8           =1609         DEC     R0
 084D 60           =1610         ADD     A,@R0           ;C6+C4  [C4+C2]
 084E 57           =1611         DA      A
 084F B654         =1612         JF0     SGSUMR          ;JUMP IF 4-CHAR SUM
                   =1613 ;
 0851 C8           =1614         DEC     R0
 0852 60           =1615         ADD     A,@R0           ;C6+C4+C2
 0853 57           =1616         DA      A
 0854 83           =1617 SGSUMR: RET
                   =1618 ;*****************************************************************
                   =1619 ;  ROUTINE:  APL3R2
                   =1620 ;  FUNCTION:  ADD 3*R2 TO A.  (BCD)
                   =1621 ;  ENTRY:  NO SETUP
                   =1622 ;  EXIT:   A = A+(3*R2)
                   =1623 ;          R2 = NOT CHANGED
                   =1624 ;
 0855 6A           =1625 APL3R2: ADD     A,R2
 0856 57           =1626         DA      A
 0857 6A           =1627         ADD     A,R2
 0858 57           =1628         DA      A
 0859 6A           =1629         ADD     A,R2
 085A 57           =1630         DA      A
 085B 83           =1631         RET
                   =1632 ;*****************************************************************
                   =1633 ;  ROUTINE:  MOD10A  6-2-86  14:25  BOB ACTIS
                   =1634 ;  FUNCTION:  CALCULATE 6 CHARACTER MODULO 10 CHECKSUM VALUE
                   =1635 ;  ENTRY:  R0 = FIRST BYTE ADDRESS OF SEGMENT TO BE PROCESSED
                   =1636 ;  EXIT:  A = CALCULATED VALUE
                   =1637 ;
 085C 1437         =1638 MOD10A: CALL    SGSUM6
 085E 1455         =1639         CALL    APL3R2
 0860 83           =1640         RET
                   =1641 ;*****************************************************************
                   =1642 ;  ROUTINE:  MOD10B  6-2-86  14:25  BOB ACTIS
                   =1643 ;  FUNCTION:  CALCULATE 6 CHARACTER MODULO 10 CHECKSUM VALUE
                   =1644 ;  ENTRY:  R0 = FIRST BYTE ADDRESS OF SEGMENT TO BE PROCESSED
                   =1645 ;  EXIT:  A = CALCULATED VALUE
                   =1646 ;
 0861 1438         =1647 MOD10B: CALL    SGSUM6
 0863 1455         =1648         CALL    APL3R2
 0865 83           =1649         RET
                    1650 $       INCLUDE(:F1:EMOD10.SRC)
                   =1651 ;*****************************************************************
                   =1652 ;  FILE:  EMOD10.SRC  6-17-86 16:25  BOB ACTIS
                   =1653 ;  ROUTINE:  EMOD10
                   =1654 ;  FUNCTION:  VERIFY THE EMOD10 CHECK CHARACTER
                   =1655 ;  ENTRY:  SEGMENT IN SCAN BUFFER
                   =1656 ;  EXIT:  USES R0,R1,R2,A
                   =1657 ;          A = 0 IF CHECK CHARACTER IS GOOD
                   =1658 ;          A <> 0 IF CHECK CHARACTER IS BAD
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   23
GNA09S ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

 0866 B820      =1660 EMOD10: MOV     R0,#SCNBUF
 0868 B979      =1661         MOV     R1,#WRKBUF
 086A 142A      =1662         CALL    MOV3BY          ;MOVE SCAN BUFFER DATA TO WORK BUFFER
                =1663 ;
 086C B822      =1664         MOV     R0,#SCNBUF+2
 086E F0        =1665         MOV     A,@R0           ;GET CHARACTER C6
 086F 530F      =1666         ANL     A,#0FH
 0871 03FD      =1667         ADD     A,#-3
 0873 F27C      =1668         JB7     ECASE1          ;JUMP IF C6=0,1,2
 0875 C685      =1669         JZ      ECASE2          ;JUMP IF C6=3
 0877 07        =1670         DEC     A
 0878 C690      =1671         JZ      ECASE3          ;JUMP IF C6=4
 087A 0496      =1672         JMP     ECASE4          ;JUMP IF C6=5,6,7,8,9
                =1673 ;
                =1674 ;  FOR C6=0,1,2 COMPUTE 3*(C2+C3+C5)+C1+C4+C6
                =1675 ;
 087C B879      =1676 ECASE1: MOV     R0,#WRKBUF
 087E F0        =1677         MOV     A,@R0
 087F 47        =1678         SWAP    A
 0880 A0        =1679         MOV     @R0,A           ;SWAP C1 AND C2
 0881 1438      =1680         CALL    SGSUM6          ;C2,C1,C3,C4,C5,C6
 0883 0498      =1681         JMP     EMODSM
                =1682 ;
                =1683 ;  FOR C6=3  COMPUTE 3*(C2+C4+C5)+C1+C3+C4
                =1684 ;
 0885 B87A      =1685 ECASE2: MOV     R0,#WRKBUF+1
 0887 27        =1686         CLR     A
 0888 30        =1687         XCHD    A,@R0           ;C4=0
 0889 18        =1688         INC     R0
 088A 30        =1689         XCHD    A,@R0           ;C6=C4
 088B F0        =1690         MOV     A,@R0           ;A=C5,C4
 088C 47        =1691         SWAP    A               ;A=C4,C5
 088D A0        =1692         MOV     @R0,A
 088E 0496      =1693         JMP     ECASE4          ;C1,C2,C3,0,C4,C5
                =1694 ;  FOR C6=4  COMPUTE 3*(C2+C4+C5)+C1+C3+0
                =1695 ;
 0890 B87B      =1696 ECASE3: MOV     R0,#WRKBUF+2
 0892 27        =1697         CLR     A
 0893 20        =1698         XCH     A,@R0           ;C5=C6=0
 0894 47        =1699         SWAP    A
 0895 30        =1700         XCHD    A,@R0           ;C5=0, C6=C5
                =1701                                 ;C1,C2,C3,C4,0,C5
                =1702 ;
                =1703 ;  FOR C6=5,6,7,8,9  COMPUTE 3*(C2+C4+C6)+C1+C3+C5
                =1704 ;
 0896 B879      =1705 ECASE4: MOV     R0,#WRKBUF      ;C1,C2,C3,C4,C5,C6
 0898 1438      =1706         CALL    SGSUM6
 089A 2A        =1707         XCH     A,R2
                =1708 ;
                =1709 ;  FINAL SUM
                =1710 ;
 0898 1455      =1711 EMODSM: CALL    APL3R2
                =1712 ;
                =1713 ;  CHECK AGAINST THE CHECK CHARACTER
                =1714 ;
 0890 B823      =1715 EMODCK: MOV     R0,#SCNBUF+3
 089F 60        =1716         ADD     A,@R0
 08A0 57        =1717         DA      A
 08A1 530F      =1718         ANL     A,#0FH
 08A3 83        =1719         RET
                 1720 $       INCLUDE(:F1:FCXFCA.SRC)
                =1721 ;*****************************************************************
                =1722 ;  FILE:  FCXFCA.SRC  10-25-83 17:10  BOB ACTIS
                =1723 ;  ROUTINE:  CXFCA
                =1724 ;  FUNCTION:  CHECK IF FRAME CONTROL ARRAY HAS DATA.
                =1725 ;               IF SDATA, PROCESS BYTE.
                =1726 ;               IF SEGMENT CAPTURE AND SCANNING BIT IS SET, PUT SEGMENT
                =1727 ;                  INTO THE SCAN BUFFER.
                =1728 ;               IF SEGMENT CAPTURE AND NOT SCANNING, RESET THE FRAME.
                =1729 ;               IF A SEGMENT IS SEEN, SET R7.
                =1730 ;  ENTRY:  RB0
                =1731 ;  EXIT:  USES R0,R1,A
                =1732 ;               R7 IS SET IF A SEGMENT IS SEEN.
                =1733 ;
 08A4 86A7      =1734 CXFCA:  JNI     CXFC10          ;JUMP IF FCA HAS DATA
 08A6 83        =1735         RET
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   24
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

 08A7 B801      =1737 CKFC10: MOV     R0,#ESRRD
 08A9 FC        =1738         MOV     A,R4
 08AA 1283      =1739         JB0     CKFC20          ;JUMP IF SCANNING BIT IS SET
 08AC 80        =1740         MOVX    A,@R0           ;READ BYTE
 08AD F2DF      =1741         JB7     CKFC95          ;JUMP IF HOST DATA
 08AF 90        =1742         MOVX    @R0,A           ;RESET FRAME CAPTURE
 08B0 BF08      =1743         MOV     R7,#EWAIT       ;SET THE "SEG SEEN" TIMER
 08B2 83        =1744         RET
                =1745 ;
 08B3 80        =1746 CKFC20: MOVX    A,@R0           ;READ 1ST CHAR OF SEGMENT
 08B4 F2DF      =1747         JB7     CKFC95          ;JUMP IF HOST DATA
 08B6 02DB      =1748         JB6     CKFC90          ;JUMP IF PERIODICAL CAPTURE
 08B8 B920      =1749         MOV     R1,#SCNBUF
                =1750 ;
 08BA 47        =1751         SWAP    A
 08BB A1        =1752         MOV     @R1,A           ;STORE 1ST CHAR
 08BC 80        =1753         MOVX    A,@R0           ;READ 2ND CHAR OF SEGMENT
 08BD 31        =1754         XCHD    A,@R1           ;1ST AND 2ND STORED
 08BE 19        =1755         INC     R1
 08BF 80        =1756         MOVX    A,@R0           ;READ 3RD CHAR
                =1757 ;
 08C0 47        =1758         SWAP    A
 08C1 A1        =1759         MOV     @R1,A           ;STORE 3RD CHAR
 08C2 80        =1760         MOVX    A,@R0           ;READ 4TH CHAR
 08C3 31        =1761         XCHD    A,@R1           ;3RD AND 4TH STORED
 08C4 19        =1762         INC     R1
 08C5 80        =1763         MOVX    A,@R0           ;READ 5TH CHAR
                =1764 ;
 08C6 47        =1765         SWAP    A
 08C7 A1        =1766         MOV     @R1,A           ;STORE 5TH CHAR
 08C8 80        =1767         MOVX    A,@R0
 08C9 31        =1768         XCHD    A,@R1           ;5TH AND 6TH STORED
 08CA 19        =1769         INC     R1
                =1770 ;
 08CB B804      =1771         MOV     R0,#EPRDEC
 08CD 80        =1772         MOVX    A,@R0           ;READ PARITY DECODE BYTE
 08CE 537F      =1773         ANL     A,#07FH         ;MASK OFF THE UNUSED BIT
 08D0 A1        =1774         MOV     @R1,A           ;STORE PARITY DECODE B0-B6
                =1775 ;
 08D1 D37F      =1776         XRL     A,#07FH         ;TEST FOR NO DECODE. (BAD PARITY MAP)
 08D3 9609      =1777         JNZ     CKFC80          ;JUMP IF DECODE IS OK.
 08D5 140C      =1778         CALL    CLRSNB          ;CLEAR THE SCAN BUFFER
 08D7 0408      =1779         JMP     CKFC90
                =1780 ;
 08D9 BF08      =1781 CKFC80: MOV     R7,#EWAIT       ;SET THE "SEG SEEN" TIMER
                =1782 ;
 08DB B801      =1783 CKFC90: MOV     R0,#EFRRST
 08DD 90        =1784         MOVX    @R0,A           ;RESET THE FRAME
 08DE 83        =1785         RET
                =1786 ;
 08DF E5        =1787 CKFC95: SEL     MB0
 08E0 143F      =1788         CALL    SDATA
 08E2 F5        =1789         SEL     MB1
 08E3 83        =1790         RET
                 1791 ;*************************************
 08E4 A3         1792 TROPGB: MOVP    A,@A
 08E5 83         1793         RET
 0900            1794         ORG     0900H
                 1795 $        INCLUDE(:F1:NCOMM.SRC)
                =1796 ;*****************************************************************
                =1797 ;  FILE:  NCOMM.SRC  4-16-87  DREV TAUSSIG
                =1798 ;         MODIFIED   8-5-87 REMOVE P13 FROM HANDSHAKE
                =1799 ;  ROUTINE:  NCOMM -- FOR THE IBM 4683 SERIAL IO CHANNEL
                =1800 ;                    COMMUNICATES WITH ZILOG SUPER-8 CHANNEL CONTROLLER
                =1801 ;  FUNCTION:  SEND NEXT CHARACTER IN SEND BUFFER TO HOST
                =1802 ;             CHECK FOR AND RECEIVE COMMAND FROM HOST (SUPER-8).
                =1803 ;  ENTRY:  RB0 SELECTED
                =1804 ;  EXIT:  USES R0,R1,R2,R3,A
                =1805 ;
 0900           =1806 NCOMM   EQU     $
 0900 0A        =1807         IN      A,P2
 0901 F211      =1808         JB7     NCOM05          ;JUMP IF SUPER-8 DOES NOT HAVE DATA
                =1809 ;
                =1810 ;  DATA AVAILABLE - READ AND SET HANDSHAKE
                =1811 ;
 0903 B808      =1812         MOV     R0,#ESUP8       ;ADDRESS OF SUPER-8 DATA BYTE
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                    PAGE  25
GNA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

0906 99FB      =1814          ANL     P1,#255-EP12    ;P12 LOW TO ACKNOWLEDGE RECEIPT OF DATA
0908 A8        =1815          MOV     R0,A            ;SAVE BYTE
               =1816 ;
0909 0A        =1817 NCOM03: IN       A,P2
090A 37        =1818          CPL     A
090B F209      =1819          JB7     NCOM03          ;JUMP WAIT FOR SUPER-8 TO ACKNOWLEDGE
090D 8904      =1820          ORL     P1,#EP12        ;P12 HIGH TO END HANDSHAKE SEQUENCE
               =1821 ;
               =1822 ;   CHECK RECEIVED COMMAND
               =1823 ;
090F 245E      =1824          JMP     CKRCV           ;GO EXECUTE COMMAND
               =1825 ;
               =1826 ;   SUPER-8 IN RECEIVE MODE - CHECK FOR DATA AVAILABLE AND SEND
               =1827 ;
0911 FC        =1828 NCOM05: MOV      A,R4
0912 721A      =1829          JB3     NCOM10          ;JUMP IF SEND BUFFER HAS DATA
0914 37        =1830          CPL     A
0915 B250      =1831          JB5     NCOM90          ;JUMP IF BUFMAN REQUEST FLAG NOT SET
0917 F409      =1832          CALL    BUFMAN          ;PUT MESSAGE INTO THE COMM BUFFER
0919 83        =1833          RET
               =1834 ;
091A 2650      =1835 NCOM10: JNTO     NCOM90          ;JUMP IF HOST NOT READY
               =1836 ;
091C B966      =1837          MOV     R1,#SBFPNT      ;GET POINTER ADDRESS
091E F1        =1838          MOV     A,@R1           ;GET POINTER
091F 97        =1839          CLR     C
0920 67        =1840          RRC     A               ;PUT NIBBLE POINTER IN CARRY
0921 11        =1841          INC     @R1             ;INCREMENT POINTER
0922 A9        =1842          MOV     R1,A            ;BYTE ADDRESS
               =1843 ;
0923 F1        =1844          MOV     A,@R1           ;GET DATA
0924 53F0      =1845          ANL     A,#0F0H         ;MASK POSSIBLE TERMINATOR FLAG
0926 D3F0      =1846          XRL     A,#0F0H         ;TEST FOR TERMINATOR FLAG, 0FXH
0928 C63D      =1847          JZ      NCOM50          ;JUMP IF TERMINATOR FLAG
               =1848 ;
092A F1        =1849          MOV     A,@R1           ;GET DATA AGAIN
092B D3CC      =1850          XRL     A,#ETRMBY
092D C653      =1851          JZ      NCOM70          ;JUMP IF TERMINATION BYTE
               =1852 ;
092F F1        =1853          MOV     A,@R1           ;GET DATA AGAIN
0930 F633      =1854          JC      NCOM20          ;JUMP IF LOW NIBBLE IS NEXT
               =1855 ;
0932 47        =1856          SWAP    A
0933 530F      =1857 NCOM20: ANL      A,#0FH          ;MASK NIBBLE
0935 A8        =1858          MOV     R3,A            ;SAVE NIBBLE
0936 D30C      =1859          XRL     A,#0CH
0938 C650      =1860          JZ      NCOM90          ;JUMP IF FILLER CHARACTER (DON'T SEND)
               =1861 ;
               =1862 ;  IBM-OCR CHARACTER FORMAT
093A FB        =1863 NCOM40: MOV      A,R3            ;GET CHARACTER
093B 2655      =1864          JMP     NCOM50
               =1865 ;
               =1866 ;  PROCESS THE TERMINATOR FLAG BYTE
093D B866      =1867 NCOM50: MOV      R0,#SBFPNT      ;COMM BUFFER POINTER ADDRESS
093F 10        =1868          INC     @R0             ;INCREMENT PAST TERMINATION FLAG BYTE
0940 BB4A      =1869          MOV     R3,#LOW NCTBLI  ;IBM-OCR TABLE ADDRESS
               =1870 ;
0942 F1        =1871 NCOM60: MOV      A,@R1           ;GET TERMINATION FLAG BYTE
0943 530F      =1872          ANL     A,#0FH          ;MASK VERSION POINTER, 1 TO 9
0945 07        =1873          DEC     A               ;ADJUST POINTER, 0 TO 8
0946 6B        =1874          ADD     A,R3            ;VERSION POINTER + TABLE ADDRESS
0947 A3        =1875          MOVP    A,@A            ;GET TERMINATION CHARACTER
0948 2455      =1876          JMP     NCOM60
               =1877 ;
               =1878 ;  TERMINATION CHARACTERS FOR IBM-OCR
094A           =1879 NCTBLI   EQU     $               ;TABLE START ADDRESS
094A 0D        =1880          DB      0DH             ;  A
0948 16        =1881          DB      16H             ; 13
094C 0A        =1882          DB      0AH             ;  E
094D 0C        =1883          DB      0CH             ;  8
094E 00        =1884          DB      00H             ; D1, NOT DEFINED
094F 00        =1885          DB      00H             ; D2, NOT DEFINED
0950 00        =1886          DB      00H             ; D3, NOT DEFINED
0951 00        =1887          DB      00H             ; D4, NOT DEFINED
0952 00        =1888          DB      00H             ; D5, NOT DEFINED
               =1889 ;
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   26
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

 0953 2380      =1891 NCOM70: MOV     A,#80H          ;EOT WITH DUMMY DATA (OOH WITH B7 SET)
                =1892 ;
                =1893 ;  SEND FORMATED CHARACTER TO SUPER-8
 0955 B808      =1894 NCOM80: MOV     R0,#ESUP8
 0957 90        =1895         MOVX    @R0,A           ;OUTPUT FORMATTED CHARACTER
 0958 37        =1896         CPL     A
 0959 F250      =1897         JB7     NCOM90          ;JUMP IF NOT END OF DATA
 095B 1416      =1898         CALL    CLRSBF          ;CLEAR SEND BUFFER, ETC.
 095D 83        =1899 NCOM90: RET
                =1900 ;*****************************************************************
                =1901 ;   ROUTINE: CKRCV
                =1902 ;   FUNCTION: CHECK RECEIVED BYTE COMMAND AND EXECUTE IT
                =1903 ;   ENTRY:  R0 IS RECEIVED BYTE
                =1904 ;   EXIT:   COMMAND EXECUTED
                =1905 ;
 095E           =1906 CKRCV   EQU     $
 095E F8        =1907         MOV     A,R0
                =1908 ;
 095F D311      =1909 CKRCV1: XRL     A,#ENSCAN
 0961 9666      =1910         JNZ     CKRCV2          ;JUMP IF NOT ENABLE SCANNING COMMAND
 0963 99EF      =1911         ANL     P1,#OFFH-ELASDB ;TURN ON LASER
 0965 83        =1912         RET
                =1913 ;
 0966 F8        =1914 CKRCV2: MOV     A,R0
 0967 D312      =1915         XRL     A,#DISCAN
 0969 966E      =1916         JNZ     CKRCV3          ;JUMP IF NOT DISABLE SCANNING COMMAND
 0968 8910      =1917         ORL     P1,#ELASDB      ;TURN OFF LASER
 0960 83        =1918         RET
                =1919 ;
 096E F8        =1920 CKRCV3: MOV     A,R0
 096F D314      =1921         XRL     A,#ENBEEP
 0971 9677      =1922         JNZ     CKRCV4          ;JUMP IF NOT ENABLE TONE COMMAND
 0973 D5        =1923         SEL     RB1
 0974 AB        =1924         MOV     R3,A            ;SET TONE ENABLE FLAG TO 0 (ENABLE TONE)
 0975 C5        =1925         SEL     RB0
 0976 83        =1926         RET
                =1927 ;
 0977 F8        =1928 CKRCV4: MOV     A,R0
 0978 D318      =1929         XRL     A,#DIBEEP
 097A 9681      =1930         JNZ     CKRCV5          ;JUMP IF NOT DISABLE TONE COMMAND
 097C 37        =1931         CPL     A               ;A IS OFFH NOW
 097D D5        =1932         SEL     RB1
 097E AB        =1933         MOV     R3,A            ;SET TONE ENABLE FLAG TO 1'S (DISABLE TONE)
 097F C5        =1934         SEL     RB0
 0980 83        =1935         RET
                =1936 ;
 0981 F8        =1937 CKRCV5: MOV     A,R0
 0982 D332      =1938         XRL     A,#COMRST
 0984 9689      =1939         JNZ     CKRCV6          ;JUMP IF NOT RESET COMMAND
 0986 E5        =1940         SEL     MB0
 0987 0400      =1941         JMP     RSTTRP          ;RESET SCANNER
                =1942 ;
 0989 F8        =1943 CKRCV6: MOV     A,R0            ;                       (ADDED 1/21/88)
 098A D377      =1944         XRL     A,#IFRSNG       ;INTERFACE ROM SUM GOOD  (IF ROM CHKSUM)
                =1945 ;
 098C 83        =1946 CKRCV9: RET                     ;INVALID COMMAND
                 1947 $       INCLUDE(:F1:PROCSG.SRC)
                =1948 ;*****************************************************************
                =1949 ;  FILE:  PROCSG.SRC  07-03-86 15:15  BOB ACTIS
                =1950 ;*****************************************************************
                =1951 ;  ROUTINE:  SWP4SN, SWP6SN
                =1952 ;  FUNCTION:  SWAP (REVERSE) ORDER OF PACKED CHARACTERS IN SCAN BUFFER.
                =1953 ;              SWP4SN SWAPS CHARACTERS IN SCNBUF+1 AND SCNBUF+2.
                =1954 ;              SWP6SN SWAPS CHARACTERS IN SCNBUF, SCNBUF+1 AND SCNBUF+2.
                =1955 ;              CLEARS BACKWARD BIT IN THE PARITY DECODE BYTE SCNBUF+3.
                =1956 ;  ENTRY:  NO SETUP
                =1957 ;  EXIT:  CHARACTERS SWAPED.
                =1958 ;          R0 = SCNBUF+3 (PARITY DECODE BYTE ADDRESS)
                =1959 ;               BACKWARD BIT IS CLEARED.
                =1960 ;           A = PARITY DECODE BYTE
                =1961 ;
 098D B822      =1962 SWP4SN: MOV     R0,#SCNBUF+2
 098F F0        =1963         MOV     A,@R0
 0990 47        =1964         SWAP    A
 0991 C8        =1965         DEC     R0
 0992 20        =1966         XCH     A,@R0
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   27
GNA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE       SOURCE STATEMENT

 0994 18        =1968         INC     R0
 0995 A0        =1969         MOV     @R0,A
 0996 24A6      =1970         JMP     SUPXEX
                =1971 ;
 0998 B822      =1972 SUP6SN: MOV     R0,#SCNBUF+2
 099A F0        =1973         MOV     A,@R0
 099B 47        =1974         SWAP    A
 099C C8        =1975         DEC     R0
 099D 20        =1976         XCH     A,@R0
 099E 47        =1977         SWAP    A
 099F 20        =1978         XCH     A,@R0
 09A0 C8        =1979         DEC     R0
 09A1 20        =1980         XCH     A,@R0
 09A2 47        =1981         SWAP    A
 09A3 18        =1982         INC     R0
 09A4 18        =1983         INC     R0
 09A5 A0        =1984         MOV     @R0,A
                =1985 ;
 09A6 18        =1986 SUPXEX: INC     R0
 09A7 F0        =1987         MOV     A,@R0
 09A8 538F      =1988         ANL     A,#255-EDECBK
 09AA A0        =1989         MOV     @R0,A
 09AB 4409      =1990         JMP     SUPXRT
                =1991 ;*****************************************************************
                =1992 ;  ROUTINE:  INCNXB, INCLNB
                =1993 ;  FUNCTION:  INCREMENT SEGMENT COUNTERS.
                =1994 ;                LOW NIBBLE IS SEGMENT ONE COUNTER.
                =1995 ;                HIGH NIBBLE IS SEGMENT TWO COUNTER.
                =1996 ;                TERMINAL COUNT IS 15.  (OFH)
                =1997 ;              IF NOT ALREADY TERMINAL COUNT, INCREMENT THE SEGMENT
                =1998 ;              COUNTER AND TOTAL COUNTER.
                =1999 ;  ENTRY:  R0 = PACKED SEGMENT COUNTER ADDRESS
                =2000 ;           R0+1 = SEGMENT TOTAL COUNTER ADDRESS
                =2001 ;  EXIT:  IF NIBBLE WAS INCREMENTED:
                =2002 ;                R0 = SEGMENT TOTAL COUNTER ADDRESS
                =2003 ;                 A = PACKED COUNTER
                =2004 ;                CARRY = CLEAR
                =2005 ;           IF NIBBLE WAS ALREADY OFH:
                =2006 ;                R0 = PACKED SEGMENT COUNTER ADDRESS
                =2007 ;                 A = NOT DEFINED
                =2008 ;                CARRY = SET
                =2009 ;
 09AD F0        =2010 INCNXB: MOV     A,@R0           ;GET PACKED COUNTER
 09AE 97        =2011         CLR     C
 09AF 0310      =2012         ADD     A,#10H          ;INCREMENT HIGH NIBBLE
 09B1 F6C0      =2013         JC      INCXRT          ;JUMP IF ALREADY OFOH
 09B3 24BD      =2014         JMP     INCX90
                =2015 ;
 09B5 F0        =2016 INCLNB: MOV     A,@R0
 09B6 47        =2017         SWAP    A
 09B7 97        =2018         CLR     C
 09B8 0310      =2019         ADD     A,#10H
 09BA F6C0      =2020         JC      INCXRT          ;JUMP IF ALREADY OOFH
 09BC 47        =2021         SWAP    A
                =2022 ;
 09BD A0        =2023 INCX90: MOV     @R0,A           ;UPDATE THE PACKED COUNTER
 09BE 18        =2024         INC     R0
 09BF 10        =2025         INC     @R0             ;INCREMENT TOTAL COUNTER
                =2026 ;
 09C0 83        =2027 INCXRT: RET
                =2028 ;*****************************************************************
                =2029 ;  ROUTINE:  MCK2BY, MCK3BY, MCK4BY
                =2030 ;  FUNCTION:  COMPARE BYTES IN ONE BUFFER WITH A SECOND BUFFER.
                =2031 ;  ENTRY:  R0 = FIRST BYTE ADDRESS OF FIRST BUFFER
                =2032 ;           R1 = FIRST BYTE ADDRESS OF SECOND BUFFER
                =2033 ;  EXIT:  IF BUFFER ONE EQUALS BUFFER TWO:
                =2034 ;                R0 = END OF FIRST BUFFER ADDRESS PLUS 1.
                =2035 ;                R1 = END OF SECOND BUFFER ADDRESS PLUS 1.
                =2036 ;                R2 = 0
                =2037 ;                 A = 0
                =2038 ;           IF BUFFER ONE DOESN'T EQUAL BUFFER TWO:
                =2039 ;                R0 = BUFFER ONE "NOT EQUAL" BYTE ADDRESS
                =2040 ;                R1 = BUFFER TWO "NOT EQUAL" BYTE ADDRESS
                =2041 ;                R2 <> 0
                =2042 ;                 A <> 0
                =2043 ;
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   28
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

 09C3 24C8      =2045          JMP     MCKXBY
 09C5 BA03      =2046 MCK3BY:  MOV     R2,#3
 09C7 24C8      =2047          JMP     MCKXBY
 09C9 BA04      =2048 MCK4BY:  MOV     R2,#4
 09CB F0        =2049 MCKXBY:  MOV     A,@R0
 09CC D1        =2050          XRL     A,@R1
 09CD 9603      =2051          JNZ     MCKXRT          ;JUMP IF NOT EQUAL
 09CF 18        =2052          INC     R0
 0900 19        =2053          INC     R1
 0901 EAC8      =2054          DJNZ    R2,MCKXBY
 0903 83        =2055 MCKXRT:  RET
                =2056 ;*************************************************
 0904 A3        =2057 TROPG9:  MOVP    A,@A
 0905 83        =2058          RET
 0A00           =2059          ORG     0A00H
                =2060 ;*************************************************************************
                =2061 ;  ROUTINE:  PROCSG
                =2062 ;  FUNCTION:  CHECK FOR SCAN BUFFER DATA.
                =2063 ;              SWAP SCAN BUFFER DATA IF BACKWARDS.
                =2064 ;              CHECK FOR MISMATCHES.
                =2065 ;              MOVE SCAN BUFFER TO PROPER SEGMENT BUFFER.
                =2066 ;              INCREMENT SEGMENT AND TOTAL COUNTERS.
                =2067 ;  ENTRY:  NO SETUP
                =2068 ;  EXIT:  USES R0,R1,R2,R3,A
                =2069 ;
 0A00 2480      =2070 SWP4SJ:  JMP     SWP4SN
 0A02 2498      =2071 SWP6SJ:  JMP     SWP6SN
                =2072 ;
 0A04 B823      =2073 PROCSG:  MOV     R0,#SCNBUF+3
 0A06 F0        =2074          MOV     A,@R0           ;GET PARITY DECODE BYTE
 0A07 C650      =2075          JZ      PROCRT          ;JUMP IF NO DATA
                =2076 ;
 0A09 B228      =2077 SWPXRT:  JB5     PROCDX          ;JUMP IF UPC-D BIT SET
 0A0B 923D      =2078          JB4     PROCE           ;JUMP IF UPC-E BIT SET
 0A0D 530F      =2079          ANL     A,#0FH
 0A0F 0300      =2080          ADD     A,#0            ;SETS CARRY FLAGS FOR DA
 0A11 57        =2081          DA      A
 0A12 9219      =2082          JB4     PROC05          ;JUMP IF DECODE > 9
                =2083 ;
 0A14           =2084 PROC3L   EQU     $               ;PROCESS AN EAN-13-L
 0A14 F0        =2085 PROCD:   MOV     A,@R0           ;PROCESS A D-SEGMENT
 0A15 D202      =2086          JB6     SWP6SJ          ;JUMP IF BACKWARDS
 0A17 6400      =2087          JMP     PRO7CH
                =2088 ;
 0A19 3245      =2089 PROC05:  JB1     PROCA           ;JUMP IF UPC-A
 0A1B F0        =2090 PROCB:   MOV     A,@R0           ;EAN-8 COMES HERE
 0A1C D200      =2091          JB6     SWP4SJ          ;JUMP IF BACKWARDS
 0A1E 1224      =2092          JB0     PROCBR          ;JUMP IF EAN-8-R
 0A20 BB3A      =2093 PROC8L:  MOV     R3,#L4SCNT
 0A22 4451      =2094          JMP     PRO4CH          ;GO PROCESS A 4-CHAR SEG
 0A24 BB40      =2095 PROC8R:  MOV     R3,#R4SCNT
 0A26 4451      =2096          JMP     PRO4CH
                =2097 ;
 0A28 530F      =2098 PROCDX:  ANL     A,#0FH
 0A2A C614      =2099          JZ      PROCD           ;JUMP IF UPC-D SEG
 0A2C F0        =2100 PROCDH:  MOV     A,@R0
 0A2D D200      =2101          JB6     SWP4SJ
 0A2F 530F      =2102          ANL     A,#0FH          ;PROCESS N(1) TO N(6) SEGS
 0A31 0336      =2103          ADD     A,#LOW  PROCNT-1
 0A33 A3        =2104          MOVP    A,@A            ;GET THE SEGMENT COUNTER ADDRESS
 0A34 A8        =2105          MOV     R3,A
 0A35 4451      =2106          JMP     PRO4CH
 0A37 46        =2107 PROCNT:  DB      LOW N1SCNT
 0A38 4C        =2108          DB      LOW N2SCNT
 0A39 52        =2109          DB      LOW N3SCNT
 0A3A 58        =2110          DB      LOW N4SCNT
 0A3B 5E        =2111          DB      LOW N5SCNT
 0A3C 64        =2112          DB      LOW N6SCNT
                =2113 ;
 0A3D D202      =2114 PROCE:   JB6     SWP6SJ
 0A3F 1466      =2115          CALL    EMOD10
 0A41 964E      =2116          JNZ     PROCEX          ;JUMP IF EMOD10 TEST FAILED
 0A43 6400      =2117          JMP     PRO7CH
                =2118 ;
 0A45 F0        =2119 PROCA:   MOV     A,@R0
 0A46 D202      =2120          JB6     SWP6SJ
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2          PAGE  29
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

 0A6A 6400      =2122 PROCAL: JMP     PRO7CH
 0A6C 6495      =2123 PROCAR: JMP     PRO6CH
                =2124 ;
 0A6E 140C      =2125 PROCEX: CALL    CLRSNB          ;GO CLEAR THE SCAN BUFFER
 0A70 83        =2126 PROCRT: RET                     ;RETURN FROM PROCESS SEGMENT ROUTINE
                =2127 ;*************************************************************************
                =2128 ;  ROUTINE:  PRO4CH
                =2129 ;  FUNCTION:  PROCESS 4-CHAR SEGMENTS (2 BYTES)
                =2130 ;              CHECKS FOR MISMATCHES.
                =2131 ;              MOVES SEGMENT FROM SCAN BUFFER TO SEGMENT BUFFER.
                =2132 ;              INCREMENTS SCAN AND TOTAL COUNTERS.
                =2133 ;  ENTRY:  R3 = PACKED SCAN COUNTER ADDRESS
                =2134 ;          R3-6 = SCAN 1 BUFFER ADDRESS
                =2135 ;          R3-2 = SCAN 2 BUFFER ADDRESS
                =2136 ;          R3+1 = TOTAL COUNTER ADDRESS
                =2137 ;  EXIT:   SEGMENT PROCESSED
                =2138 ;          SCAN BUFFER CLEARED
                =2139 ;          USES R0,R1,R2,R3,A
                =2140 ;
 0A71 FB        =2141 PRO4CH: MOV     A,R3
 0A72 A8        =2142         MOV     R0,A
 0A73 F0        =2143         MOV     A,@R0           ;GET S2/S1 PACKED COUNTS
 0A74 530F      =2144         ANL     A,#0FH
 0A76 8821      =2145         MOV     R0,#SCNBUF+1
 0A78 9662      =2146         JNZ     PRO4C2          ;JUMP IF SCAN 1 COUNTER <> 0
                =2147 ;
 0A7A FB        =2148         MOV     A,R3            ;SCAN 1 COUNTER = 0
 0A7B 03FC      =2149         ADD     A,#-4
 0A7D A9        =2150         MOV     R1,A            ;SCAN 1 BUFFER ADDRESS
 0A7E 1426      =2151         CALL    MOV2BY
 0A80 646A      =2152         JMP     PRO4C3
                =2153 ;
 0A82 FB        =2154 PRO4C2: MOV     A,R3            ;SCAN 1 COUNTER <> 0
 0A83 03FC      =2155         ADD     A,#-4
 0A85 A9        =2156         MOV     R1,A            ;SCAN 1 BUFFER ADDRESS
 0A86 34C1      =2157         CALL    MCN2BY
 0A88 9670      =2158         JNZ     PRO4C4          ;JUMP IF NO MATCH
                =2159 ;
 0A8A FB        =2160 PRO4C3: MOV     A,R3
 0A8B A8        =2161         MOV     R0,A
 0A8C 34B5      =2162         CALL    INCLNB          ;INCREMENT SCAN 1 COUNTER AND TOTAL
 0A8E 646E      =2163         JMP     PROCEX
                =2164 ;
 0A70 FB        =2165 PRO4C4: MOV     A,R3            ;SCAN 1 BUFFER DOESN'T MATCH
 0A71 A8        =2166         MOV     R0,A
 0A72 F0        =2167         MOV     A,@R0
 0A73 53F0      =2168         ANL     A,#0F0H
 0A75 8821      =2169         MOV     R0,#SCNBUF+1
 0A77 9681      =2170         JNZ     PRO4C6          ;JUMP IF SCAN 2 COUNTER <> 0
                =2171 ;
 0A79 FB        =2172         MOV     A,R3
 0A7A 03FE      =2173         ADD     A,#-2
 0A7C A9        =2174         MOV     R1,A            ;SCAN 2 BUFFER ADDRESS
 0A7D 1426      =2175         CALL    MOV2BY
 0A7F 6489      =2176         JMP     PRO4C7
                =2177 ;
 0A81 FB        =2178 PRO4C6: MOV     A,R3            ;SCAN 2 COUNT <> 0
 0A82 03FE      =2179         ADD     A,#-2
 0A84 A9        =2180         MOV     R1,A            ;SCAN 2 BUFFER ADDRESS
 0A85 34C1      =2181         CALL    MCN2BY
 0A87 968F      =2182         JNZ     PRO4C8          ;JUMP IF NO MATCH
                =2183 ;
 0A89 FB        =2184 PRO4C7: MOV     A,R3
 0A8A A8        =2185         MOV     R0,A
 0A8B 34AD      =2186         CALL    INCNB           ;INCREMENT SCAN 2 COUNT AND TOTAL
 0A8D 646E      =2187         JMP     PROCEX
                =2188 ;
 0A8F FB        =2189 PRO4C8: MOV     A,R3            ;NEITHER SCAN BUFFER MATCHED
 0A90 17        =2190         INC     A
 0A91 A8        =2191         MOV     R0,A            ;TOTAL COUNTER ADDRESS
 0A92 10        =2192         INC     @R0             ;INCREMENT TOTAL COUNTER
 0A93 646E      =2193         JMP     PROCEX
                =2194 ;*************************************************************************
                =2195 ;  ROUTINE:  PRO6CH
                =2196 ;  FUNCTION:  PROCESS 6-CHAR SEGMENTS (3 BYTES)
                =2197 ;              CHECKS FOR MISMATCHES.
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   30
GNA09S ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

                 #2199 ;              INCREMENTS SCAN AND TOTAL COUNTERS.
                 #2200 ;  ENTRY:  NO SETUP
                 #2201 ;  EXIT:  SEGMENT IS PROCESSED
                 #2202 ;         SCAN BUFFER CLEARED
                 #2203 ;         USES R0,R1,R2,R3,A
                 #2204 ;
 0A95 B834       #2205 PRO6CH: MOV     R0,#R6SCNT
 0A97 F0         #2206         MOV     A,@R0           ;GET S2/S1 PACKED COUNTS
 0A98 530F       #2207         ANL     A,#0FH
 0A9A B92E       #2208         MOV     R1,#R6S1
 0A9C B820       #2209         MOV     R0,#SCNBUF
 0A9E 96A4       #2210         JNZ     PRO6C2          ;JUMP IF SCAN 1 COUNTER <> 0
                 #2211 ;
 0AA0 142A       #2212         CALL    MOV3BY          ;SCAN 1 COUNTER = 0
 0AA2 44A8       #2213         JMP     PRO6C3
                 #2214 ;
 0AA4 34C5       #2215 PRO6C2: CALL    MCH3BY          ;SCAN 1 COUNTER <> 0
 0AA6 96AE       #2216         JNZ     PRO6C4          ;JUMP IF NO MATCH
                 #2217 ;
 0AA8 B834       #2218 PRO6C3: MOV     R0,#R6SCNT
 0AAA 3485       #2219         CALL    INCLNB          ;INCREMENT SCAN 1 COUNTER AND TOTAL
 0AAC 444E       #2220         JMP     PROCEX
                 #2221 ;
 0AAE B834       #2222 PRO6C4: MOV     R0,#R6SCNT      ;SCAN 1 BUFFER DOESN'T MATCH
 0AB0 F0         #2223         MOV     A,@R0
 0AB1 53F0       #2224         ANL     A,#0F0H
 0AB3 B931       #2225         MOV     R1,#R6S2
 0AB5 B820       #2226         MOV     R0,#SCNBUF
 0AB7 96BD       #2227         JNZ     PRO6C6          ;JUMP IF SCAN 2 COUNTER <> 0
                 #2228 ;
 0AB9 142A       #2229         CALL    MOV3BY
 0ABB 44C1       #2230         JMP     PRO6C7
                 #2231 ;
 0ABD 34C5       #2232 PRO6C6: CALL    MCH3BY          ;SCAN 2 COUNTER <> 0
 0ABF 96C7       #2233         JNZ     PRO6C8          ;JUMP IF NO MATCH
                 #2234 ;
 0AC1 B834       #2235 PRO6C7: MOV     R0,#R6SCNT
 0AC3 34AD       #2236         CALL    INCNNB          ;INCREMENT SCAN 2 COUNT AND TOTAL
 0AC5 444E       #2237         JMP     PROCEX
                 #2238 ;
 0AC7 B835       #2239 PRO6C8: MOV     R0,#R6STOT      ;NEITHER SCAN BUFFER MATCHED
 0AC9 10         #2240         INC     @R0             ;INCREMENT TOTAL COUNTER
 0ACA 444E       #2241         JMP     PROCEX
                 #2242 ;*****************************************
 0ACC A3         #2243 TROPGA: MOVP    A,@A
 0ACD 83         #2244         RET
 0800            #2245         ORG     0800H
                 #2246 ;*************************************************************************
                 #2247 ;  ROUTINE:  PRO7CH
                 #2248 ;  FUNCTION:  PROCESS 7-CHAR SEGMENTS (4 BYTES)
                 #2249 ;              CHECKS FOR MISMATCHES.
                 #2250 ;              MOVES SEGMENT FROM SCAN BUFFER TO SEGMENT BUFFER.
                 #2251 ;              INCREMENTS SCAN AND TOTAL COUNTERS.
                 #2252 ;  ENTRY:  NO SETUP
                 #2253 ;  EXIT:  SEGMENT IS PROCESSED
                 #2254 ;         SCAN BUFFER CLEARED
                 #2255 ;         USES R0,R1,R2,R3,A
                 #2256 ;
 0800 B82C       #2257 PRO7CH: MOV     R0,#L6SCNT
 0802 F0         #2258         MOV     A,@R0           ;GET S2/S1 PACKED COUNTS
 0803 530F       #2259         ANL     A,#0FH
 0805 B924       #2260         MOV     R1,#L6S1
 0807 B820       #2261         MOV     R0,#SCNBUF
 0809 960F       #2262         JNZ     PRO7C2          ;JUMP IF SCAN 1 COUNTER <> 0
                 #2263 ;
 080B 142E       #2264         CALL    MOV4BY          ;SCAN 1 COUNTER = 0
 080D 6413       #2265         JMP     PRO7C3
                 #2266 ;
 080F 34C9       #2267 PRO7C2: CALL    MCH4BY          ;SCAN 1 COUNTER <> 0
 0811 9619       #2268         JNZ     PRO7C4          ;JUMP IF NO MATCH
                 #2269 ;
 0813 B82C       #2270 PRO7C3: MOV     R0,#L6SCNT
 0815 3485       #2271         CALL    INCLNB          ;INCREMENT SCAN 1 COUNTER AND TOTAL
 0817 444E       #2272         JMP     PROCEX
                 #2273 ;
 0819 B82C       #2274 PRO7C4: MOV     R0,#L6SCNT      ;SCAN 1 BUFFER DOESN'T MATCH
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE  31
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

 081C 53F0        =2276          ANL     A,#0F0H
 081E B928        =2277          MOV     R1,#L6S2
 0820 8820        =2278          MOV     R0,#SCNBUF
 0822 9628        =2279          JNZ     PRO7C6          ;JUMP IF SCAN 2 COUNTER <> 0
                  =2280 ;
 0824 142E        =2281          CALL    MOV4BY
 0826 642C        =2282          JMP     PRO7C7
                  =2283 ;
 0828 34C9        =2284 PRO7C6:  CALL    MCM4BY          ;SCAN 2 COUNTER <> 0
 082A 9632        =2285          JNZ     PRO7C8          ;JUMP IF NO MATCH
                  =2286 ;
 082C B82C        =2287 PRO7C7:  MOV     R0,#L6SCNT
 082E 34A0        =2288          CALL    INCNKB          ;INCREMENT SCAN 2 COUNT AND TOTAL
 0830 444E        =2289          JMP     PROCEX
                  =2290 ;
 0832 B82D        =2291 PRO7C8:  MOV     R0,#L6STOT      ;NEITHER SCAN BUFFER MATCHED
 0834 10          =2292          INC     @R0             ;INCREMENT TOTAL COUNTER
 0835 444E        =2293          JMP     PROCEX
                   2294 $        INCLUDE(:F1:VERTAG.SRC)
                  =2295 ;*****************************************************************
                  =2296 ;  FILE:  VERTAG.SRC  12-09-86 13:50  BOB ACTIS
                  =2297 ;*****************************************************************
                  =2298 ;  ROUTINE:  CDMAJ
                  =2299 ;  FUNCTION:  DETERMINE MAJORITY SEGMENT COUNTER
                  =2300 ;  ENTRY:  R0 = PACKED COUNTER ADDRESS
                  =2301 ;  EXIT:  R0 = NOT CHANGED
                  =2302 ;          USES R2,A
                  =2303 ;          CARRY SET IF LOW>=HIGH NIBBLE  (S1CNT>=S2CNT)
                  =2304 ;          CARRY CLEAR IF LOW<HIGH NIBBLE  (S1CNT<S2CNT)
                  =2305 ;
 0837 F0          =2306 CDMAJ:   MOV     A,@R0           ;GET PACKED COUNTER
 0838 530F        =2307          ANL     A,#0FH
 083A AA          =2308          MOV     R2,A            ;S1CNT
 083B F0          =2309          MOV     A,@R0
 083C 47          =2310          SWAP    A
 083D 530F        =2311          ANL     A,#0FH          ;MASK S2CNT
 083F C645        =2312          JZ      CDMAJ9          ;JUMP IF S2CNT=0
 0841 37          =2313          CPL     A
 0842 17          =2314          INC     A               ;2'S COMP S2CNT
 0843 6A          =2315          ADD     A,R2            ;S1CNT-S2CNT
 0844 83          =2316          RET
                  =2317 ;
 0845 97          =2318 CDMAJ9:  CLR     C               ;S2CNT=0 IS A SPECIAL CASE
 0846 A7          =2319          CPL     C
 0847 83          =2320          RET
                  =2321 ;*****************************************************************
                  =2322 ;  ROUTINE:  CDMISM
                  =2323 ;  FUNCTION:  CHECK FOR EXCESS MISMATCHED SEGMENTS.
                  =2324 ;            CLEAR COUNTERS IF EXCESS MISMATCHES.
                  =2325 ;  ENTRY:  SCAN 1 COUNTER HAS THE MAJORITY SEGMENT COUNT.
                  =2326 ;          R0 = PACKED SCAN2/SCAN1 SEGMENT COUNTER ADDRESS.
                  =2327 ;          R0+1 = TOTAL SEGMENT COUNTER ADDRESS.
                  =2328 ;  EXIT:  USES R1,R2,A
                  =2329 ;          R0 = NOT CHANGED
                  =2330 ;          IF TOTAL=MAJORITY (0 MISMATCHES)
                  =2331 ;               OR TOTAL-1=MAJORITY (1 MISMATCH) AND MAJORITY>=3
                  =2332 ;               OR TOTAL-2=MAJORITY (2 MISMATCH) AND MAJORITY>=15
                  =2333 ;          THEN RETURN,
                  =2334 ;          ELSE COUNTERS ARE CLEARED.
                  =2335 ;
 0848 F0          =2336 CDMISM:  MOV     A,@R0
 0849 C66F        =2337          JZ      CDMS90          ;JUMP IF S2/S1 COUNTERS=0
                  =2338 ;
 084B F8          =2339          MOV     A,R0
 084C 17          =2340          INC     A
 084D A9          =2341          MOV     R1,A            ;SCAN TOTAL COUNTER ADDRESS
                  =2342 ;
 084E F0          =2343          MOV     A,@R0
 084F 530F        =2344          ANL     A,#0FH          ;MASK S1 COUNT
 0851 AA          =2345          MOV     R2,A            ;SAVE MAJORITY COUNT
 0852 D1          =2346          XRL     A,@R1
 0853 C66F        =2347          JZ      CDMS90          ;JUMP IF TOTAL=MAJORITY (0 MISMATCHES)
                  =2348 ;
 0855 F1          =2349          MOV     A,@R1
 0856 07          =2350          DEC     A
 0857 DA          =2351          XRL     A,R2
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                    PAGE  32
CHA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                  =2353 ;
 085A F1          =2354          MOV     A,@R1
 085B 07          =2355          DEC     A
 085C 07          =2356          DEC     A
 085D DA          =2357          XRL     A,R2
 085E 966C        =2358          JNZ     CKMS80          ;JUMP IF >2 MISMATCHES
                  =2359 ;
                  =2360 ;  TOTAL-2=MAJORITY (2 MISMATCHES).  CHECK FOR MAJORITY>=15.
                  =2361 ;
 0860 FA          =2362          MOV     A,R2
 0861 03F1        =2363          ADD     A,#-15
 0863 E66C        =2364          JNC     CKMS80          ;JUMP IF <15
 0865 83          =2365          RET
                  =2366 ;
                  =2367 ;  TOTAL-1=MAJORITY (1 MISMATCH).  CHECK FOR MAJORITY>=3.
                  =2368 ;
 0866 FA          =2369 CKMS30: MOV     A,R2
 0867 03FD        =2370          ADD     A,#-3
 0869 E66C        =2371          JNC     CKMS80          ;JUMP IF <3
 086B 83          =2372          RET
                  =2373 ;
                  =2374 ;  FAILED TEST.  CLEAR COUNTERS.
                  =2375 ;
 086C 27          =2376 CKMS80: CLR     A
 086D A0          =2377          MOV     @R0,A           ;CLEAR S2/S1 COUNTERS
 086E A1          =2378          MOV     @R1,A           ;CLEAR TOTAL COUNTER
 086F 83          =2379 CKMS90: RET
                  =2380 ;*****************************************************************
                  =2381 ;  ROUTINE:  EXSBF2, EXSBF3, EXSBF4
                  =2382 ;  FUNCTION:  EXCHANGE SEGMENT BUFFERS AND COUNTERS. (2,3 OR 4 BYTES)
                  =2383 ;             (I.E. EXCHANGE BUFFER 1 DATA WITH BUFFER 2 DATA)
                  =2384 ;  ENTRY:  R0 = SCAN 1 BUFFER ADDRESS
                  =2385 ;          R0+2[3,4] = SCAN 2 BUFFER ADDRESS
                  =2386 ;          R0+3[4,5] = SCAN2/SCAN1 PACKED COUNTER ADDRESS
                  =2387 ;  EXIT:  USES R1,R2
                  =2388 ;          SCAN 1 AND SCAN 2 DATA AND COUNTERS EXCHANGED.
                  =2389 ;          R0 = SCAN2/SCAN1 COUNTER ADDRESS.
                  =2390 ;          A = SCAN2/SCAN1 COUNTERS
                  =2391 ;
 0870 BA02        =2392 EXSBF2: MOV     R2,#2
 0872 647A        =2393          JMP     EXSBFX
 0874 BA03        =2394 EXSBF3: MOV     R2,#3
 0876 647A        =2395          JMP     EXSBFX
 0878 BA04        =2396 EXSBF4: MOV     R2,#4
 087A F8          =2397 EXSBFX: MOV     A,R0            ;GET SCAN 1 BUFFER ADDRESS
 087B A9          =2398          MOV     R1,A            ;SAVE IT
 087C 6A          =2399          ADD     A,R2            ;CALCULATE SCAN 2 BUFFER ADDRESS
 087D A8          =2400          MOV     R0,A            ;SAVE IT
                  =2401 ;
 087E F0          =2402 EXSBFL: MOV     A,@R0           ;GET SCAN 2 DATA
 087F 21          =2403          XCH     A,@R1           ;EXCHANGE DATA
 0880 A0          =2404          MOV     @R0,A           ;STORE SCAN 1 DATA
 0881 18          =2405          INC     R0
 0882 19          =2406          INC     R1
 0883 EA7E        =2407          DJNZ    R2,EXSBFL
                  =2408 ;
 0885 F0          =2409          MOV     A,@R0           ;GET S2/S1 COUNTERS
 0886 47          =2410          SWAP    A               ;EXCHANGE COUNTERS
 0887 A0          =2411          MOV     @R0,A           ;SAVE COUNTERS
 0888 83          =2412          RET
                  =2413 ;*****************************************************************
                  =2414 ;  ROUTINE:  SUM12C
                  =2415 ;  FUNCTION:  CALCULATE L6S1 + R6S1 MOD-10 CHECKSUM.
                  =2416 ;  ENTRY:  L6S1 AND R6S1 HAVE DATA TO USE.
                  =2417 ;  EXIT:  A = MOD-10 CHECKSUM CALCULATION FOR 12 CHARACTERS.
                  =2418 ;          USES R0,R2,R3
                  =2419 ;
 0889 8824        =2420 SUM12C: MOV     R0,#L6S1
 088B 1461        =2421          CALL    MOD106
 088D A8          =2422          MOV     R3,A            ;SAVE LEFT HALF SUM
                  =2423 ;
 088E 882E        =2424          MOV     R0,#R6S1
 0890 1461        =2425          CALL    MOD106
 0892 68          =2426          ADD     A,R3            ;RIGHT SUM + LEFT SUM
 0893 57          =2427          DA      A
 0894 530F        =2428          ANL     A,#0FH          ;MASK SUM DIGIT
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   33
QMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                  =2430 ;*************************************************************************
                  =2431 ;  ROUTINE:  CK6TOT
                  =2432 ;  FUNCTION:  CHECK L6STOT AND R6STOT FOR COUNTS.
                  =2433 ;  ENTRY:  R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
                  =2434 ;  EXIT:  A=0 IF EITHER COUNTER < MINIMUM REQUIRED.
                  =2435 ;         A<>0 IF BOTH COUNTERS >= MINIMUM REQUIRED.
                  =2436 ;         USES R0
                  =2437 ;
 0897 B82D        =2438 CK6TOT: MOV     R0,#L6STOT
 0899 F0          =2439         MOV     A,@R0           ;GET LEFT SEGMENT TOTAL
 089A 69          =2440         ADD     A,R1
 089B F69F        =2441         JC      CK6T20          ;JUMP IF L6STOT >= -R1
 089D 27          =2442 CK6T10: CLR     A
 089E 83          =2443         RET                     ;EITHER L6 OR R6 HAD < MINIMUM
                  =2444 ;
 089F B835        =2445 CK6T20: MOV     R0,#R6STOT
 08A1 F0          =2446         MOV     A,@R0           ;GET RIGHT SEGMENT TOTAL
 08A2 69          =2447         ADD     A,R1
 08A3 E690        =2448         JNC     CK6T10          ;JUMP R6STOT < -R1
 08A5 27          =2449         CLR     A
 08A6 37          =2450         CPL     A
 08A7 83          =2451         RET                     ;BOTH L6 AND R6 HAD >= MINIMUM
                  =2452 ;*************************************************************************
                  =2453 ;  ROUTINE:  MAJSGS
                  =2454 ;  FUNCTION:  DETERMINE MAJORITY SEGMENTS.
                  =2455 ;             MOVE MAJORITY SEGMENT TO BUFFER #1 IF NECESSARY.
                  =2456 ;             (I.E. EXCHANGE BUFFER 1 AND BUFFER 2 DATA AND COUNTERS.)
                  =2457 ;             CHECK FOR EXCESS MISMATCHES.
                  =2458 ;             IF EXCESS MISMATCHES, CLEAR COUNTERS.
                  =2459 ;  ENTRY:  NO SETUP
                  =2460 ;  EXIT:  IF THE MISMATCH RATIO IS OK,
                  =2461 ;            SEGMENT BUFFER 1 AND COUNTER 1 HAS MAJORITY.
                  =2462 ;            SEGMENT BUFFER 2 AND COUNTER 2 HAS MINORITY.
                  =2463 ;         IF EXCESS MISMATCHES, SEGMENT COUNTERS ARE CLEARED.
                  =2464 ;
 08A8 B82C        =2465 MAJSGS: MOV     R0,#L6SCNT
 08AA 7437        =2466         CALL    COMAJ
 08AC F682        =2467         JC      MAJSG0          ;JUMP IF S1 IS MAJORITY
 08AE B824        =2468         MOV     R0,#L6S1
 08B0 7478        =2469         CALL    EXSBF4          ;EXCHANGE S2/S1 DATA AND COUNTERS
 08B2 7448        =2470 MAJSG0: CALL    COMISM
                  =2471 ;
 08B4 B834        =2472         MOV     R0,#R6SCNT
 08B6 7437        =2473         CALL    COMAJ
 08B8 F6BE        =2474         JC      MAJSG1
 08BA B82E        =2475         MOV     R0,#R6S1
 08BC 7474        =2476         CALL    EXSBF3
 08BE 7448        =2477 MAJSG1: CALL    COMISM
                  =2478 ;
 08C0 B808        =2479         MOV     R3,#8           ;NUMBER OF 4-CHAR SEGMENT BUFFERS
 08C2 B83A        =2480         MOV     R0,#L4SCNT      ;FIRST S2/S1 COUNTER ADDRESS
                  =2481 ;
 08C4 7437        =2482 MAJSG4: CALL    COMAJ
 08C6 F6CE        =2483         JC      MAJSG5          ;JUMP IF S1 IS THE MAJORITY
 08C8 F8          =2484         MOV     A,R0
 08C9 03FC        =2485         ADD     A,#-4           ;CALCULATE THE S1 DATA BUFFER ADDRESS
 08CB A8          =2486         MOV     R0,A
 08CC 7470        =2487         CALL    EXSBF2          ;EXCHANGE S2/S1 DATA AND COUNTS
                  =2488 ;
 08CE 7448        =2489 MAJSG5: CALL    COMISM          ;CHECK MISMATCHES
 08D0 F8          =2490         MOV     A,R0
 08D1 0306        =2491         ADD     A,#6            ;CALCULATE NEXT S2/S1 COUNTER ADDRESS
 08D3 A8          =2492         MOV     R0,A
 08D4 E8C4        =2493         DJNZ    R3,MAJSG4
 08D6 83          =2494         RET
                  =2495 ;*************************************************
 08D7 A3          =2496 TROPGB: MOVP    A,@A
 08D8 83          =2497         RET
 0C00             =2498         ORG     0C00H
                  =2499 ;*************************************************************************
                  =2500 ;  ROUTINE:  VERTAG
                  =2501 ;  FUNCTION:  PERFORM MISMATCH TEST AND GET MAJORITY SEGMENT AND COUNT
                  =2502 ;               INTO BUFFER AND COUNTER #1.  (MAJSGS)
                  =2503 ;             TRY TO BUILD BLOCKS INTO VERSIONS.  (TBLOCK)
                  =2504 ;  ENTRY:  NO SETUP
                  =2505 ;  EXIT:  A=0 IF ENOUGH BLOCKS FOR A VERSION ARE FOUND.
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE  34
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                   =2507 ;         R6 SET TO INDICATE VALID VERSION IF ONE WAS FOUND.
                   =2508 ;         R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED.
                   =2509 ;
 0C00 74A8         =2510 VERTAG: CALL    MAJSGS          ;MAJORITY/MISMATCH SEGMENT TEST
 0C02 3400         =2511         CALL    MCOMM           ;CHECK COMM.  MAJSGS TAKES A WHILE.
 0C04 FE           =2512         MOV     A,R6
 0C05 53F0         =2513         ANL     A,#0F0H         ;CLEAR THE VERSION POINTER/FLAG.
 0C07 AE           =2514         MOV     R6,A
                   =2515 ;
 0C08 B9FE         =2516         MOV     R1,#-2          ;REQUIRE 2 SCANS MINIMUM
 0C0A B87D         =2517         MOV     R0,#CONFIG
 0C0C F0           =2518         MOV     A,@R0           ;GET THE CONFIGURATION BYTE
 0C0D 3211         =2519         JB1     TRYBLK          ;JUMP IF 6 CHAR 2 SCAN BIT IS SET
 0C0F B9FF         =2520         MOV     R1,#-1          ;REQUIRE 1 SCAN MINIMUM
                   =2521 ;
 0C11 9463         =2522 TRYBLK: CALL    TBLKA
 0C13 C661         =2523         JZ      VERA            ;JUMP IF A GOOD UPC-A BLOCK
                   =2524 ;
 0C15 9480         =2525         CALL    TBLK13
 0C17 C660         =2526         JZ      VER13           ;JUMP IF A GOOD EAN-13 BLOCK
                   =2527 ;
 0C19 949F         =2528         CALL    TBLK2
 0C1B C635         =2529         JZ      VERT10          ;JUMP IF A GOOD BLK-2
                   =2530 ;
 0C1D B9FE         =2531         MOV     R1,#-2          ;ALWAYS REQUIRE 2 SCANS MINIMUM FOR E
 0C1F 94AF         =2532         CALL    TBLKE
 0C21 C65F         =2533         JZ      VERE            ;JUMP IF A GOOD UPC-E BLOCK
                   =2534 ;
 0C23 B9FE         =2535         MOV     R1,#-2
 0C25 B87D         =2536         MOV     R0,#CONFIG
 0C27 F0           =2537         MOV     A,@R0           ;GET THE CONFIGURATION BYTE
 0C28 122C         =2538         JB0     VERT05          ;JUMP IF 4 CHAR 2 SCAN BIT IS SET
 0C2A B9FF         =2539         MOV     R1,#-1
                   =2540 ;
 0C2C B42F         =2541 VERT05: CALL    TBLK1
 0C2E C658         =2542         JZ      VERD1           ;JUMP IF A GOOD BLK-1.  (D-1)
                   =2543 ;
 0C30 94C2         =2544         CALL    TBLK8
 0C32 C65E         =2545         JZ      VER8            ;JUMP IF A GOOD EAN-8 BLOCK
 0C34 83           =2546         RET                     ;RETURN IF NOT ENOUGH BLOCKS
                   =2547 ;
 0C35 B9FE         =2548 VERT10: MOV     R1,#-2
 0C37 B87D         =2549         MOV     R0,#CONFIG
 0C39 F0           =2550         MOV     A,@R0           ;GET THE CONFIGURATION BYTE
 0C3A 123E         =2551         JB0     VERT15          ;JUMP IF 4 CHAR 2 SCAN BIT IS SET
 0C3C B9FF         =2552         MOV     R1,#-1
                   =2553 ;
 0C3E B49E         =2554 VERT15: CALL    TBLK5
 0C40 C648         =2555         JZ      VERT20          ;JUMP IF A GOOD BLK-5
                   =2556 ;
 0C42 B406         =2557         CALL    TBLK6
 0C44 C656         =2558         JZ      VERD3           ;JUMP IF A GOOD BLK-6.  (D-3)
                   =2559 ;
 0C46 B466         =2560         CALL    TBLK3
 0C48 C657         =2561         JZ      VERD2           ;JUMP IF A GOOD BLK-3.  (D-2)
 0C4A 83           =2562         RET                     ;RETURN IN NOT ENOUGH BLOCKS
                   =2563 ;
 0C4B B48A         =2564 VERT20: CALL    TBLK7
 0C4D C654         =2565         JZ      VERD5           ;JUMP IF A GOOD BLK-7.  (D-5)
                   =2566 ;
 0C4F B482         =2567         CALL    TBLK4
 0C51 C655         =2568         JZ      VERD4           ;JUMP IF A GOOD BLK-4.  (D-4)
 0C53 83           =2569         RET                     ;RETURN IF NOT ENOUGH BLOCKS
                   =2570 ;
 0C54 1E           =2571 VERD5:  INC     R6              ;SET R6=9
 0C55 1E           =2572 VERD4:  INC     R6              ;SET R6=8
 0C56 1E           =2573 VERD3:  INC     R6              ;SET R6=7
 0C57 1E           =2574 VERD2:  INC     R6              ;SET R6=6
 0C58 1E           =2575 VERD1:  INC     R6              ;SET R6=5
                   =2576 ;
                   =2577 ;
 0C59 2301         =2578         MOV     A,#1            ;NO VERSION 0 ALLOWED
                   =2579 ;
 0C5B BE00         =2580 VERT80: MOV     R6,#0           ;CLEAR THE VERSION FLAG
 0C5D 83           =2581         RET                     ;RETURN W/ A<>0, NO VERSIONS
                   =2582 ;
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   35
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE       SOURCE STATEMENT

 0C5F 1E        =2584 VERE:   INC     R6              ;SET R6=3
 0C60 1E        =2585 VER13:  INC     R6              ;SET R6=2
 0C61 1E        =2586 VERA:   INC     R6              ;SET R6=1
                =2587 ;
 0C62 83        =2588 VERT90: RET
                 2589 $       INCLUDE(:F1:TBLOCK.SRC)
                =2590 ;*****************************************************************************
                =2591 ;  FILE:  TBLOCK.SRC  09-11-86 09:10  BOB ACTIS
                =2592 ;*****************************************************************************
                =2593 ;  ROUTINE:  TBLKA
                =2594 ;  FUNCTION:  TRY FOR A VALID UPC-A BLOCK.
                =2595 ;                 CHECK THAT L6 AND R6 HAVE ENOUGH DATA.
                =2596 ;                 CHECK THAT L6 IS AN A-L.
                =2597 ;                 IF OK SO FAR, CALCULATE MOD-10 CHECK CHARACTER.
                =2598 ;                 IF STILL OK, RETURN WITH A=0.
                =2599 ;                 IF MOD-10 ERROR, CLEAR 486-CHAR SEGMENT COUNTERS AND
                =2600 ;                        CLEAR VERSION POINTER/FLAG.
                =2601 ;  ENTRY:  SCAN 1 BUFFER IS MAJORITY SCAN.
                =2602 ;          R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
                =2603 ;  EXIT:  USES R0,R2,R3,A
                =2604 ;         A=0 IF GOOD BLOCK
                =2605 ;         A<>0 IF NO BLOCK
                =2606 ;
 0C63 7497      =2607 TBLKA:  CALL    CK6TOT
 0C65 C67D      =2608         JZ      TBNONE          ;JUMP IF NO LEFT OR NO RIGHT SEGMENTS
                =2609 ;
 0C67 B827      =2610         MOV     R0,#L6S1+3
 0C69 F0        =2611         MOV     A,@R0           ;GET PARITY DECODE BYTE
 0C6A 530C      =2612         ANL     A,#0CH
 0C6C D30C      =2613         XRL     A,#0CH
 0C6E 9670      =2614         JNZ     TBNONE          ;JUMP IF NOT AND AL
                =2615 ;
 0C70 7489      =2616         CALL    SUM12C          ;GO CALCULATE LEFT + RIGHT CHECKSUM
 0C72 9675      =2617         JNZ     TBERR6          ;JUMP IF MOD-10 IS BAD
 0C74 83        =2618         RET
                =2619 ;
                =2620 ;  THE FOLLOWING IS USED BY OTHER TBLXXX ROUTINES, BUFMAN, & RDTAG
                =2621 ;
 0C75           =2622 CLRVER  EQU     $       ;ENTRY POINT TO CLEAR VERSION FLAGS & DATA
 0C75 1400      =2623 TBERR6: CALL    CLR6SG          ;CLEAR 6-CHAR SEGMENTS AND COUNTERS
 0C77 1406      =2624 TBERR4: CALL    CLR4SG          ;CLEAR 4-CHAR SEGMENTS AND COUNTERS
 0C79 FE        =2625         MOV     A,R6
 0C7A 53F0      =2626         ANL     A,#0F0H         ;CLEAR VERSION POINTER/FLAG
 0C7C AE        =2627         MOV     R6,A
 0C7D 27        =2628 TBNONE: CLR     A
 0C7E 37        =2629         CPL     A
 0C7F 83        =2630         RET
                =2631 ;*****************************************************************************
                =2632 ;  ROUTINE:  TBLK13
                =2633 ;  FUNCTION:  TRY FOR A VALID EAN-13 BLOCK.
                =2634 ;                 CHECK THAT L6 AND R6 HAVE ENOUGH DATA.
                =2635 ;                 CHECK THAT L6 IS AN EAN-13-L.
                =2636 ;                 IF OK SO FAR, CALCULATE MOD-10 CHECK CHARACTER.
                =2637 ;                 IF STILL OK, RETURN WITH A=0.
                =2638 ;                 IF MOD-10 FAILS, CLEAR 486-CHAR SEGMENT COUNTER AND
                =2639 ;                    CLEAR VERSION POINTER/FLAG.
                =2640 ;  ENTRY:  SCAN 1 BUFFER IS MAJORITY SCAN.
                =2641 ;          R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
                =2642 ;  EXIT:  USES R0,R2,R3,A
                =2643 ;         A=0 IF GOOD BLOCK.
                =2644 ;         A<>0 IF NO BLOCK FOUND.
                =2645 ;
 0C80 7497      =2646 TBLK13: CALL    CK6TOT
 0C82 C67D      =2647         JZ      TBNONE          ;JUMP IF NO LEFT OR NO RIGHT SEGMENTS
                =2648 ;
 0C84 B827      =2649         MOV     R0,#L6S1+3
 0C86 F0        =2650         MOV     A,@R0           ;GET PARITY DECODE BYTE
 0C87 5330      =2651         ANL     A,#EDECE+EDECD  ;MASK D AND E SEG BITS
 0C89 967D      =2652         JNZ     TBNONE          ;JUMP IF D OR E SEGMENT
                =2653 ;
 0C8B F0        =2654         MOV     A,@R0
 0C8C 530F      =2655         ANL     A,#0FH          ;MASK THE DECODED CHARACTER
 0C8E 03F6      =2656         ADD     A,#-10          ;A>9 IS AN A OR B SEGMENT
 0C90 F67D      =2657         JC      TBNONE          ;JUMP IS A OR B SEGMENT
                =2658 ;
 0C92 7489      =2659         CALL    SUM12C
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   36
GNA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

                 =2661 ;
 0C95 B827       =2662          MOV     R0,#L6S1+3
 0C97 F0         =2663          MOV     A,@R0           ;GET PARITY DECODE CHARACTER
 0C98 68         =2664          ADD     A,R3            ;ADD 13TH CHARACTER
 0C99 57         =2665          DA      A
 0C9A 530F       =2666          ANL     A,#0FH
 0C9C 9675       =2667          JNZ     TBERR6          ;JUMP IF MOD-10 IS BAD
 0C9E 83         =2668          RET
                 =2669 ;*********************************************************************
                 =2670 ;  ROUTINE:  TBLK2
                 =2671 ;  FUNCTION:  TRY FOR A VALID VERSION-0 BLOCK-2.
                 =2672 ;                 CHECK THAT L6 AND R6 HAVE ENOUGH DATA.
                 =2673 ;                 CHECK THAT L6 IS A D-TAG.
                 =2674 ;                 IF OK SO FAR, CALCULATE MOD-10 CHECK CHARACTER.
                 =2675 ;                 IF STILL OK, RETURN WITH A=0.
                 =2676 ;                 IF MOD-10 ERROR, CLEAR 486-CHAR SEGMENT COUNTERS AND
                 =2677 ;                    CLEAR VERSION POINTER/FLAG.
                 =2678 ;  ENTRY:  SCAN 1 BUFFER IS MAJORITY SCAN.
                 =2679 ;          R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
                 =2680 ;  EXIT:  USES R0,R2,R3,A
                 =2681 ;          A=0 IF GOOD BLOCK
                 =2682 ;          A<>0 IF NO BLOCK
                 =2683 ;
 0C9F 7497       =2684 TBLK2:   CALL    CK6TOT
 0CA1 C67D       =2685          JZ      TBNONE          ;JUMP IF NO LEFT OR NO RIGHT SEGMENTS
                 =2686 ;
 0CA3 B827       =2687          MOV     R0,#L6S1+3
 0CA5 F0         =2688          MOV     A,@R0           ;GET PARITY DECODE BYTE
 0CA6 5320       =2689          ANL     A,#EDECD
 0CA8 C67D       =2690          JZ      TBNONE          ;JUMP IF NOT A D-TAG.
                 =2691 ;
 0CAA 7489       =2692          CALL    SUM12C
 0CAC 9675       =2693          JNZ     TBERR6          ;JUMP IF MOD-10 TEST FAILED
 0CAE 83         =2694          RET
                 =2695 ;*********************************************************************
                 =2696 ;  ROUTINE:  TBLKE
                 =2697 ;  FUNCTION:  TRY FOR A VALID UPC-E BLOCK.
                 =2698 ;                 CHECK THAT L6 HAS ENOUGH DATA
                 =2699 ;                 CHECK THAT L6 IS AN E-TAG.
                 =2700 ;                 CHECK THAT R6 HAS NO DATA.
                 =2701 ;               IF OK, RETURN WITH A=0.
                 =2702 ;               ELSE, CLEAR 486-CHAR SEGMENT COUNTERS AND
                 =2703 ;                    CLEAR THE VERSION POINTER/FLAG.
                 =2704 ;  ENTRY:  SCAN 1 BUFFER IS THE MAJORITY SCAN.
                 =2705 ;          R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
                 =2706 ;  EXIT:  USES R0,A
                 =2707 ;          A=0 IF GOOD BLOCK.
                 =2708 ;          A<>0 IF NO BLOCK.
                 =2709 ;
 0CAF B82D       =2710 TBLKE:   MOV     R0,#L6STOT
 0CB1 F0         =2711          MOV     A,@R0
 0CB2 69         =2712          ADD     A,R1
 0CB3 E67D       =2713          JNC     TBNONE          ;JUMP IF < -R1 LEFT SEGMENTS
                 =2714 ;
 0CB5 B827       =2715          MOV     R0,#L6S1+3
 0CB7 F0         =2716          MOV     A,@R0           ;GET PARITY DECODE BYTE
 0CB8 5310       =2717          ANL     A,#EDECE
 0CBA C67D       =2718          JZ      TBNONE          ;JUMP IF NOT AN E-SEG.
                 =2719 ;
 0CBC B835       =2720          MOV     R0,#R6STOT
 0CBE F0         =2721          MOV     A,@R0
 0CBF 9675       =2722          JNZ     TBERR6          ;JUMP IF R6 SEGMENTS ARE PRESENT
                 =2723 ;
 0CC1 83         =2724          RET
                 =2725 ;*********************************************************************
                 =2726 ;  ROUTINE:  TBLKB
                 =2727 ;  FUNCTION:  TRY FOR A VALID EAN-8 BLOCK.
                 =2728 ;                 IF ANY 6-CHAR SEGMENTS ARE PRESENT, CLEAR 4-CHAR
                 =2729 ;                   SEGMENT COUNTERS AND VERSION POINTER/FLAG.
                 =2730 ;                 CHECK THAT L4 AND R4 HAVE ENOUGH DATA.
                 =2731 ;                 IF OK SO FAR, CALCULATE THE MOD-10 CHECK CHARACTER.
                 =2732 ;                 IF STILL OK, RETURN WITH A=0.
                 =2733 ;                 IF MOD-10 ERROR, CLEAR 4-CHAR SEGMENT COUNTERS AND
                 =2734 ;                    CLEAR VERSION POINTER/FLAG.
                 =2735 ;  ENTRY:  SCAN 1 BUFFER IS THE MAJORITY SCAN.
                 =2736 ;          R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                    PAGE   37
GHA09S ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                   =2738 ;         A=0 IF GOOD BLOCK
                   =2739 ;         A<>0 IF NO BLOCK
                   =2740 ;
 0CC2 B82D         =2741 TBLK8:  MOV     R0,#L6STOT
 0CC4 F0           =2742         MOV     A,@R0
 0CC5 9677         =2743         JNZ     TBERR4          ;JUMP IF ANY 6L SEGMENTS
                   =2744 ;
 0CC7 B835         =2745         MOV     R0,#R6STOT
 0CC9 F0           =2746         MOV     A,@R0
 0CCA 9677         =2747         JNZ     TBERR4          ;JUMP IF ANY 6R SEGMENTS
                   =2748 ;
 0CCC B838         =2749         MOV     R0,#L4STOT
 0CCE F0           =2750         MOV     A,@R0
 0CCF 69           =2751         ADD     A,R1
 0CD0 E67D         =2752         JNC     TBNONE          ;JUMP IF < -R1 LEFT HALF SEGMENTS
                   =2753 ;
 0CD2 B841         =2754         MOV     R0,#R4STOT
 0CD4 F0           =2755         MOV     A,@R0
 0CD5 69           =2756         ADD     A,R1
 0CD6 E67D         =2757         JNC     TBNONE          ;JUMP IF < -R1 RIGHT HALF SEGMENTS
                   =2758 ;
 0CD8 B836         =2759         MOV     R0,#L4S1
 0CDA 145C         =2760         CALL    MOD104
 0CDC A8           =2761         MOV     R3,A            ;SAVE LEFT SUM
 0CDD B83C         =2762         MOV     R0,#R4S1
 0CDF 145C         =2763         CALL    MOD104
 0CE1 68           =2764         ADD     A,R3            ;RIGHT SUM + LEFT SUM
 0CE2 57           =2765         DA      A
 0CE3 530F         =2766         ANL     A,#0FH
 0CE5 9677         =2767         JNZ     TBERR4          ;JUMP IF MOD-10 IS BAD
 0CE7 83           =2768         RET
                   =2769 ;*****************************************
 0CE8 A3           =2770 TROPGC: MOVP    A,@A
 0CE9 83           =2771         RET
 0D00              =2772         ORG     0D00H
                   =2773 ;*****************************************************************
                   =2774 ;  ROUTINE:  TBLK6
                   =2775 ;  FUNCTION:  TRY FOR A VALID VERSION-D BLOCK-6.
                   =2776 ;               CHECK THAT N(3), N(5) AND S(R) HAVE ENOUGH DATA.
                   =2777 ;               IF THEY DO, CALCULATE MOD-10 CHECK CHARACTER.
                   =2778 ;               IF OK, RETURN WITH A=0.
                   =2779 ;               ELSE, CLEAR 4-CHAR SEGMENT COUNTERS AND
                   =2780 ;                 CLEAR THE VERSION POINTER/FLAG.
                   =2781 ;  ENTRY:  SCAN 1 IS THE MAJORITY SCAN.
                   =2782 ;          R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
                   =2783 ;  EXIT:  USES R0,R2,R3,A
                   =2784 ;          A=0 IF GOOD BLOCK
                   =2785 ;          A<>0 IF NO BLOCK
                   =2786 ;
 0000 8477         =2787 TBER4J: JMP     TBERR4
 0002 8475         =2788 TBER6J: JMP     TBERR6
 0004 847D         =2789 TBNONJ: JMP     TBNONE
                   =2790 ;
 0006 B853         =2791 TBLK6:  MOV     R0,#N3STOT
 0008 F0           =2792         MOV     A,@R0
 0009 69           =2793         ADD     A,R1
 000A E604         =2794         JNC     TBNONJ          ;JUMP IF < -R1 N3 SEGMENTS
                   =2795 ;
 000C B85F         =2796         MOV     R0,#N5STOT
 000E F0           =2797         MOV     A,@R0
 000F 69           =2798         ADD     A,R1
 0010 E604         =2799         JNC     TBNONJ          ;JUMP IF < -R1 N5 SEGMENTS
                   =2800 ;
 0012 B841         =2801         MOV     R0,#R4STOT
 0014 F0           =2802         MOV     A,@R0
 0015 69           =2803         ADD     A,R1
 0016 E604         =2804         JNC     TBNONJ          ;JUMP IF < -R1 8R SEGMENTS
                   =2805 ;
 0018 B84E         =2806         MOV     R0,#N3S1
 001A 145C         =2807         CALL    MOD104
 001C A8           =2808         MOV     R3,A
                   =2809 ;
 001D B85A         =2810         MOV     R0,#N5S1
 001F 145C         =2811         CALL    MOD104
 0021 68           =2812         ADD     A,R3
 0022 57           =2813         DA      A
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE  38
CHA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                   =2815 ;
 0024 B83C         =2816          MOV     R0,#R4S1
 0026 145C         =2817          CALL    MOD10&
 0028 68           =2818          ADD     A,R3
 0029 57           =2819          DA      A
 002A 530F         =2820          ANL     A,#0FH
 002C 9600         =2821          JNZ     TBER6J
 002E 83           =2822          RET
                   =2823 ;*****************************************************************
                   =2824 ;  ROUTINE:  TBLK1
                   =2825 ;  FUNCTION:  TRY FOR A VALID VERSION-0 BLOCK-1.
                   =2826 ;               CHECK THAT L6, N(6) AND S(L) HAVE ENOUGH DATA.
                   =2827 ;               CHECK THAT L6 IS A D-TAG
                   =2828 ;               REVERSE SL DATA
                   =2829 ;               CALCULATE MOD-10 CHECK CHARACTER.
                   =2830 ;               IF OK, RETURN WITH A=0.
                   =2831 ;               ELSE, CLEAR 4&6-CHAR SEGMENT COUNTERS AND
                   =2832 ;                 CLEAR THE VERSION POINTER/FLAG.
                   =2833 ;  ENTRY:  SCAN 1 IS THE MAJORITY SCAN.
                   =2834 ;            R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
                   =2835 ;  EXIT:  USES R0,R2,R3,A
                   =2836 ;          A=0 IF GOOD BLOCK
                   =2837 ;          A<>0 IF NO BLOCK
                   =2838 ;
 002F B820         =2839 TBLK1:   MOV     R0,#L6STOT
 0031 F0           =2840          MOV     A,@R0
 0032 69           =2841          ADD     A,R1
 0033 E604         =2842          JNC     TBNONJ          ;JUMP IF < -R L6 SEGMENTS
                   =2843 ;
 0035 B827         =2844          MOV     R0,#L6S1+3
 0037 F0           =2845          MOV     A,@R0           ;GET PARITY DECODE BYTE
 0038 5320         =2846          ANL     A,#DEDECD
 003A C604         =2847          JZ      TBNONJ          ;JUMP IF NOT A D-TAG
                   =2848 ;
 003C B865         =2849          MOV     R0,#N6STOT
 003E F0           =2850          MOV     A,@R0
 003F 69           =2851          ADD     A,R1
 0040 E604         =2852          JNC     TBNONJ          ;JUMP IF < -R1 N6 SEGMENTS
                   =2853 ;
 0042 B838         =2854          MOV     R0,#L4STOT
 0044 F0           =2855          MOV     A,@R0
 0045 69           =2856          ADD     A,R1
 0046 E604         =2857          JNC     TBNONJ          ;JUMP IF < -R1 SL SEGMENTS
                   =2858 ;
 0048 B824         =2859          MOV     R0,#L6S1
 004A 1461         =2860          CALL    MOD10&
 004C AB           =2861          MOV     R3,A
                   =2862 ;
 004D B860         =2863          MOV     R0,#N6S1
 004F 145C         =2864          CALL    MOD10&
 0051 68           =2865          ADD     A,R3
 0052 57           =2866          DA      A
 0053 AB           =2867          MOV     R3,A
                   =2868 ;
 0054 B836         =2869          MOV     R0,#L4S1        ;REVERSE SL DATA
 0056 F0           =2870          MOV     A,@R0           ;GET CHAR 1&2
 0057 47           =2871          SWAP    A
 0058 18           =2872          INC     R0
 0059 20           =2873          XCH     A,@R0           ;GET CHAR 3&4, SAVE CHAR 2&1
 005A 47           =2874          SWAP    A
 005B C8           =2875          DEC     R0
 005C A0           =2876          MOV     @R0,A           ;SAVE CHAR 4&3
                   =2877 ;
 005D 145C         =2878          CALL    MOD10&
 005F 68           =2879          ADD     A,R3
 0060 57           =2880          DA      A
 0061 530F         =2881          ANL     A,#0FH
 0063 9602         =2882          JNZ     TBER6J
 0065 83           =2883          RET
                   =2884 ;*****************************************************************
                   =2885 ;  ROUTINE:  TBLK3
                   =2886 ;  FUNCTION:  TRY FOR A VALID VERSION-0 BLOCK-3.
                   =2887 ;               CHECK THAT N(2) AND S(R) HAVE ENOUGH DATA.
                   =2888 ;               IF THEY DO, CALCULATE MOD-10 CHECK CHARACTER.
                   =2889 ;               IF OK, RETURN WITH A=0.
                   =2890 ;               ELSE, CLEAR 4-CHAR SEGMENT COUNTERS AND
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   39
GHA095 ASSEMBLED 2/22/88 BY BLAIKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

                 =2892 ;  ENTRY:  SCAN 1 IS THE MAJORITY SCAN.
                 =2893 ;          R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
                 =2894 ;  EXIT:  USES R0,R2,R3,A
                 =2895 ;         A=0 IF GOOD BLOCK
                 =2896 ;         A<>0 IF NO BLOCK
                 =2897 ;
 0066 B840       =2898 TBLK3:  MOV     R0,#N2STOT
 0068 F0         =2899         MOV     A,@R0
 0069 69         =2900         ADD     A,R1
 006A E604       =2901         JNC     TBNONJ          ;JUMP IF < -R1 N2 SEGMENTS
                 =2902 ;
 006C B841       =2903         MOV     R0,#R4STOT
 006E F0         =2904         MOV     A,@R0
 006F 69         =2905         ADD     A,R1
 0070 E604       =2906         JNC     TBNONJ          ;JUMP IF < -R1 R4 SEGMENTS
                 =2907 ;
 0072 B848       =2908         MOV     R0,#N2S1
 0074 145C       =2909         CALL    MOD10
 0076 AB         =2910         MOV     R3,A
                 =2911 ;
 0077 B83C       =2912         MOV     R0,#R4S1
 0079 145C       =2913         CALL    MOD10
 007B 6B         =2914         ADD     A,R3
 007C 57         =2915         DA      A
 007D 530F       =2916         ANL     A,#0FH
 007F 9600       =2917         JNZ     TBER4J
 0081 83         =2918         RET
                 =2919 ;*****************************************************************
                 =2920 ;  ROUTINE:  TBLK4
                 =2921 ;  FUNCTION:  TRY FOR A VALID VERSION-0 BLOCK-4.
                 =2922 ;               CHECK THAT N(5) AND N(1) HAVE ENOUGH DATA.
                 =2923 ;               IF THEY DO, CALCULATE MOD-10 CHECK CHARACTER.
                 =2924 ;               IF OK, RETURN WITH A=0.
                 =2925 ;               ELSE, CLEAR 4-CHAR SEGMENT COUNTERS AND
                 =2926 ;                 CLEAR THE VERSION POINTER/FLAG.
                 =2927 ;  ENTRY:  SCAN 1 IS THE MAJORITY SCAN.
                 =2928 ;          R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
                 =2929 ;  EXIT:  USES R0,R2,R3,A
                 =2930 ;         A=0 IF GOOD BLOCK
                 =2931 ;         A<>0 IF NO BLOCK
                 =2932 ;
 0082 B85F       =2933 TBLK4:  MOV     R0,#N5STOT
 0084 F0         =2934         MOV     A,@R0
 0085 69         =2935         ADD     A,R1
 0086 E604       =2936         JNC     TBNONJ          ;JUMP IF < -R1 N5 SEGMENTS
                 =2937 ;
 0088 B847       =2938         MOV     R0,#N1STOT
 008A F0         =2939         MOV     A,@R0
 008B 69         =2940         ADD     A,R1
 008C E604       =2941         JNC     TBNONJ          ;JUMP IF < -R1 N1 SEGMENTS
                 =2942 ;
 008E B85A       =2943         MOV     R0,#N5S1
 0090 145C       =2944         CALL    MOD10
 0092 AB         =2945         MOV     R3,A
                 =2946 ;
 0093 B842       =2947         MOV     R0,#N1S1
 0095 145C       =2948         CALL    MOD10
 0097 6B         =2949         ADD     A,R3
 0098 57         =2950         DA      A
 0099 530F       =2951         ANL     A,#0FH
 009B 9600       =2952         JNZ     TBER4J
 009D 83         =2953         RET
                 =2954 ;*****************************************************************
                 =2955 ;  ROUTINE:  TBLK5
                 =2956 ;  FUNCTION:  TRY FOR A VALID VERSION-0 BLOCK-5.
                 =2957 ;               CHECK THAT N(4) AND B(R) HAVE ENOUGH DATA.
                 =2958 ;               IF THEY DO, CALCULATE MOD-10 CHECK CHARACTER.
                 =2959 ;               IF OK, RETURN WITH A=0.
                 =2960 ;               ELSE, CLEAR 4-CHAR SEGMENT COUNTERS AND
                 =2961 ;                 CLEAR THE VERSION POINTER/FLAG.
                 =2962 ;  ENTRY:  SCAN 1 IS THE MAJORITY SCAN.
                 =2963 ;          R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
                 =2964 ;  EXIT:  USES R0,R2,R3,A
                 =2965 ;         A=0 IF GOOD BLOCK
                 =2966 ;         A<>0 IF NO BLOCK
                 =2967 ;
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   40
CHA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

 0DA0 F0        =2969          MOV     A,@R0
 0DA1 69        =2970          ADD     A,R1
 0DA2 E6D4      =2971          JNC     TBNONJ          ;JUMP IF < -R1 N4 SEGMENTS
                =2972 ;
 0DA4 B841      =2973          MOV     R0,#R4STOT
 0DA6 F0        =2974          MOV     A,@R0
 0DA7 69        =2975          ADD     A,R1
 0DA8 E6D4      =2976          JNC     TBNONJ          ;JUMP IF < -R1 BR SEGMENTS
                =2977 ;
 0DAA B854      =2978          MOV     R0,#N4S1
 0DAC 145C      =2979          CALL    MOD104
 0DAE A8        =2980          MOV     R3,A
                =2981 ;
 0DAF B83C      =2982          MOV     R0,#R4S1
 0DB1 145C      =2983          CALL    MOD104
 0DB3 68        =2984          ADD     A,R3
 0DB4 57        =2985          DA      A
 0DB5 530F      =2986          ANL     A,#0FH
 0DB7 9600      =2987          JNZ     TBER4J
 0DB9 83        =2988          RET
                =2989 ;*********************************************************************
                =2990 ;  ROUTINE:  TBLK7
                =2991 ;  FUNCTION:  TRY FOR A VALID VERSION-D BLOCK-7.
                =2992 ;                CHECK THAT N(3), N(6) AND N(1) HAVE ENOUGH DATA.
                =2993 ;                IF THEY DO, CALCULATE MOD-10 CHECK CHARACTER.
                =2994 ;                IF OK, RETURN WITH A=0.
                =2995 ;                ELSE, CLEAR 4-CHAR SEGMENT COUNTERS AND
                =2996 ;                  CLEAR THE VERSION POINTER/FLAG.
                =2997 ;  ENTRY:  SCAN 1 IS THE MAJORITY SCAN.
                =2998 ;          R1 SETUP WITH MINUS THE MINIMUM NUMBER OF SCANS REQUIRED
                =2999 ;  EXIT:  USES R0,R2,R3,A
                =3000 ;         A=0 IF GOOD BLOCK
                =3001 ;         A<>0 IF NO BLOCK
                =3002 ;
 0DBA B853      =3003 TBLK7:   MOV     R0,#N3STOT
 0DBC F0        =3004          MOV     A,@R0
 0DBD 69        =3005          ADD     A,R1
 0DBE E6D4      =3006          JNC     TBNONJ          ;JUMP IF < -R1 N3 SEGMENTS
                =3007 ;
 0DC0 B865      =3008          MOV     R0,#N6STOT
 0DC2 F0        =3009          MOV     A,@R0
 0DC3 69        =3010          ADD     A,R1
 0DC4 E6D4      =3011          JNC     TBNONJ          ;JUMP IF < -R1 N6 SEGMENTS
                =3012 ;
 0DC6 B847      =3013          MOV     R0,#N1STOT
 0DC8 F0        =3014          MOV     A,@R0
 0DC9 69        =3015          ADD     A,R1
 0DCA E6D4      =3016          JNC     TBNONJ          ;JUMP IF < -R1 N1 SEGMENTS
                =3017 ;
 0DCC B84E      =3018          MOV     R0,#N3S1
 0DCE 145C      =3019          CALL    MOD104
 0DD0 A8        =3020          MOV     R3,A
                =3021 ;
 0DD1 B860      =3022          MOV     R0,#N6S1
 0DD3 145C      =3023          CALL    MOD104
 0DD5 68        =3024          ADD     A,R3
 0DD6 57        =3025          DA      A
 0DD7 A8        =3026          MOV     R3,A
                =3027 ;
 0DD8 B842      =3028          MOV     R0,#N1S1
 0DDA 145C      =3029          CALL    MOD104
 0DDC 68        =3030          ADD     A,R3
 0DDD 57        =3031          DA      A
 0DDE 530F      =3032          ANL     A,#0FH
 0DE0 9600      =3033          JNZ     TBER4J
 0DE2 83        =3034          RET
                 3035 ;*****************************************
 0DE3 A3         3036 TROPCD:  MOVP    A,@A
 0DE4 83         3037          RET
 0E00            3038          ORG     0E00H
                 3039 $        INCLUDE(:F1:SLRDTG.SRC)
                =3040 ;*********************************************************************
                =3041 ;  FILE:  SLRDTG.SRC  10-08-86 15:55  BOB ACTIS
                =3042 ;  ROUTINE:  RDTAG FOR THE 750SL **THIS IS THE MAIN PROGRAM**
                =3043 ;
 0E00 FC        =3044 RDTAG:   MOV     A,R4                    ;CLEAR THE SCAN FLAGS EXCEPT FOR
```

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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2          PAGE  41
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ        LINE        SOURCE STATEMENT

 0E03 AC       =3046          MOV     R4,A              ;BUFMAN REQUEST
 0E04 B208     =3047          JB5     RDT05           ;JUMP IF THE BUFMAN REQUEST FLAG IS SET
               =3048 ;
 0E06 9475     =3049          CALL    CLRVER          ;CLEAR THE VERSION POINTER/FLAG & DATA
 0E08 140C     =3050 RDT05:   CALL    CLRSNB          ;CLEAR THE SCAN BUFFER
               =3051 ;
               =3052 ;  WAIT FOR THE LABEL TO GO AWAY.  CHECK MOTOR SPEED.
               =3053 ;
 0E0A D484     =3054 RDT10:   CALL    MTRCHK          ;CHECK MOTOR SPEED
 0E0C 3400     =3055          CALL    MCOMM           ;SERVICE THE I/F AND BUFMAN
 0E0E 8619     =3056          JNI     RDT20           ;JUMP IF SYNCAP (SEGMENT OR SDATA)
               =3057 ;
 0E10 FF       =3058          MOV     A,R7            ;GET THE "SEG SEEN" TIMER
 0E11 960A     =3059          JNZ     RDT10           ;JUMP IF A SEG RECENTLY SEEN
               =3060 ;
 0E13 BD16     =3061          MOV     R5,#EDRDLY      ;SET THE DOUBLE READ TIMER
               =3062 ;
 0E15 BF2A     =3063 RDT15:   MOV     R7,#EGDLTW      ;SET THE GD-LT ON TIMER
 0E17 C41F     =3064          JMP     RDT30           ;GO WAIT FOR A LABEL TO READ
               =3065 ;
               =3066 ;  RESET THE SYNCAP OR SERVICE SDATA
               =3067 ;
 0E19 14A4     =3068 RDT20:   CALL    CKFCA           ;RESET THE SEG, ALSO CHECK FOR SDATA
 0E1B 3400     =3069          CALL    MCOMM           ;SERVICE THE I/F AND BUFMAN.  ALSO
 0E1D C40A     =3070          JMP     RDT10           ;DELAY FOR FCA TO RESET
               =3071 ;
               =3072 ;  WAIT FOR A LABEL TO READ.  CHECK GD-LT ON TIME AND MOTOR SPEED.
               =3073 ;
 0E1F FC       =3074 RDT30:   MOV     A,R4
 0E20 4301     =3075          ORL     A,#ESCNG        ;SET THE SCAN FLAG SO CKFCA WILL
 0E22 AC       =3076          MOV     R4,A            ;PUT THE SEGMENT INTO THE SCAN BUFFER
               =3077 ;
 0E23 3400     =3078 RDT35:   CALL    MCOMM
 0E25 14A4     =3079          CALL    CKFCA           ;SERVICE FCA.  POSSIBLE SEG OR SDATA.
 0E27 B823     =3080          MOV     R0,#SCNBUF+3
 0E29 F0       =3081          MOV     A,@R0           ;GET THE SCAN BUF PARITY DECODE BYTE
 0E2A 9637     =3082          JNZ     RDT40           ;JUMP IF SCAN BUFFER HAS DATA
               =3083 ;
 0E2C D484     =3084          CALL    MTRCHK          ;CHECK MOTOR SPEED
               =3085 ;
 0E2E FF       =3086          MOV     A,R7
 0E2F 9623     =3087          JNZ     RDT35           ;JUMP IF GD-LT TIMER <> 0
 0E31 990F     =3088          ANL     P1,#255-EGDLT   ;GD-LT OFF
 0E33 8940     =3089          ORL     P1,#EBDLT       ;BD-LT ON
 0E35 C423     =3090          JMP     RDT35           ;STILL WAITING FOR A LABEL
               =3091 ;
               =3092 ;  START READING THE LABEL
               =3093 ;
 0E37 3400     =3094 RDT40:   CALL    MCOMM
 0E39 990F     =3095          ANL     P1,#255-EGDLT   ;GREEN LIGHT OFF
 0E3B 8940     =3096          ORL     P1,#EBDLT       ;RED LIGHT ON
 0E3D FC       =3097          MOV     A,R4
 0E3E B200     =3098          JB5     RDTAG           ;JUMP IF THE BUFMAN REQUEST FLAG IS SET
 0E40 C448     =3099          JMP     RDT60           ;GO PROCESS THE FIRST SEGMENT
               =3100 ;
               =3101 ;  COLLECT AND PROCESS SEGMENTS.  CHECK MOTOR SPEED.
               =3102 ;
 0E42 D484     =3103 RDT50:   CALL    MTRCHK          ;CHECK MOTOR SPEED
 0E44 3400     =3104          CALL    MCOMM
 0E46 14A4     =3105          CALL    CKFCA           ;GET SEGMENTS IF ANY
 0E48 5404     =3106 RDT60:   CALL    PROCSG          ;PROCESS SEGMENTS IF ANY
 0E4A E5       =3107          SEL     MB0
 0E4B D400     =3108          CALL    CKCNTS          ;CHK FOR ENOUGH SEGS FOR PSBL VERSION
 0E4D F5       =3109          SEL     MB1
 0E4E C653     =3110          JZ      RDT70           ;JUMP IF ENOUGH SEGMENTS
               =3111 ;
 0E50 FF       =3112          MOV     A,R7
 0E51 9642     =3113          JNZ     RDT50           ;JUMP IF SEGMENTS RECENTLY SEEN
               =3114 ;
               =3115 ;  TRY FOR A VALID LABEL
               =3116 ;
 0E53 3400     =3117 RDT70:   CALL    MCOMM
 0E55 9400     =3118          CALL    VERTAG
 0E57 C660     =3119          JZ      GOODRD          ;JUMP IF A GOOD VERSION WAS FOUND
               =3120 ;
 0E59 FF       =3121          MOV     A,R7
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   42
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                  =3123 ;
 0E5C 3400        =3124 BADRD:  CALL    RCOMM
 0E5E C400        =3125         JMP     RDTAG           ;GO START OVER.  NO BUFMAN REQUEST.
                  =3126 ;
 0E60 3400        =3127 GOODRD: CALL    RCOMM
 0E62 FD          =3128         MOV     A,R5            ;GET THE DOUBLE READ TIMER
 0E63 C660        =3129         JZ      GOOD10          ;JUMP IF DR TIMER=0 (OK TO DOUBLE READ)
                  =3130 ;
 0E65 E5          =3131         SEL     MB0
 0E66 F408        =3132         CALL    DRSUMT          ;CALCULATE AND TEST THE DOUBLE READ SUM
 0E68 F5          =3133         SEL     MB1
 0E69 9671        =3134         JNZ     GOOD20          ;JUMP IF OLD<>NEW (NO DOUBLE READ)
 0E6B C400        =3135         JMP     RDTAG           ;JUMP IF DOUBLE READ TOO SOON
                  =3136 ;
 0E6D E5          =3137 GOOD10: SEL     MB0
 0E6E F408        =3138         CALL    DRSUMT          ;CALCULATE AND SAVE THE LABEL SUM
 0E70 F5          =3139         SEL     MB1
 0E71 998F        =3140 GOOD20: ANL     P1,#255-EBDLT   ;BD-LT OFF
 0E73 8920        =3141         ORL     P1,#EGDLT       ;GD-LT ON
 0E75 D5          =3142         SEL     RB1
 0E76 FB          =3143         MOV     A,R3            ;TONE ENABLE FLAG·
 0E77 9678        =3144         JNZ     GOOD30          ;JUMP IF TONE DISABLED
 0E79 BE04        =3145         MOV     R6,#EGDTON      ;GOOD TONE LENGTH
 0E7B C5          =3146 GOOD30: SEL     RB0
                  =3147 ;
 0E7C FC          =3148 RDT90:  MOV     A,R4
 0E7D 4320        =3149         ORL     A,#EBFREQ       ;SET THE BUFMAN REQUEST FLAG
 0E7F AC          =3150         MOV     R4,A
 0E80 F409        =3151         CALL    BUFMAN
 0E82 C400        =3152         JMP     RDTAG
                  =3153 ;
                  =3154 ;  CHECK MOTOR UP2SPD* SIGNAL  (UP TO SPEED & OVER SPEED)
 0E84 0A          =3155 MTRCHK: IN      A,P2
 0E85 37          =3156         CPL     A
 0E86 8289        =3157         JB5     MTRC10          ;JUMP IF MOTOR SPEED PROBLEM
 0E88 83          =3158         RET                     ;RETURN IF OK
                  =3159 ;
 0E89 BF64        =3160 MTRC10: MOV     R7,#100         ;SET TIMER FOR 2 SECONDS
 0E8B FF          =3161 MTRC20: MOV     A,R7
 0E8C 968B        =3162         JNZ     MTRC20          ;WAIT IN CASE OF SPURIOUS ERROR
                  =3163 ;
 0E8E 0A          =3164         IN      A,P2
 0E8F 37          =3165         CPL     A
 0E90 8293        =3166         JB5     MTRERR          ;JUMP IF STILL A PROBLEM AFTER WAIT
 0E92 83          =3167         RET                     ;REUTRN IF OK
                  =3168 ;
                  =3169 ;  COME HERE IF THERE IS A MOTOR PROBLEM DURING RDTAG
 0E93 8910        =3170 MTRERR: ORL     P1,#ELASDB      ;LASER OFF
 0E95 9900        =3171         ANL     P1,#255-(ENTREB+EGDLT)  ;MOTOR OFF, GREEN LIGHT OFF
 0E97 B804        =3172         MOV     R0,#4
 0E99 E5          =3173         SEL     MB0
 0E9A 747F        =3174         CALL    TERRUT          ;GIVE 4 BEEPS FOR A MOTOR ERROR
 0E9C F5          =3175         SEL     MB1
                  =3176 ;
                  =3177 ;  STICK HERE WITH THE RED LIGHT FLASHING
 0E9D BF05        =3178 MTRE20: MOV     R7,#5           ;SET TIMER FOR 100MS
 0E9F FF          =3179 MTRE30: MOV     A,R7
 0EA0 969F        =3180         JNZ     MTRE30          ;WAIT BETWEEN LIGHT TOGGLES
                  =3181 ;
 0EA2 09          =3182         IN      A,P1
 0EA3 998F        =3183         ANL     P1,#255-EBDLT   ;RED LIGHT OFF
 0EA5 D299        =3184         JB6     MTRE20          ;JUMP IF THE RED LIGHT WAS ON
 0EA7 8940        =3185         ORL     P1,#EBDLT       ;RED LIGHT ON
 0EA9 C490        =3186         JMP     MTRE20
                   3187 ;*****************************************
 0EAB A3           3188 TROPGE: MOVP    A,@A
 0EAC 83           3189         RET
 0F00              3190         ORG  --  0F00H
                   3191 $        INCLUDE(:F1:BUFMAN.SRC)
                  =3192 ;*****************************************************************************
                  =3193 ;  FILE:  BUFMAN.SRC  10-08-86 16:15  BOB ACTIS
                  =3194 ;*****************************************************************************
                  =3195 ;  ROUTINE:  BUF12C
                  =3196 ;  FUNCTION:  LOAD 12 CHARACTERS INTO THE COMMUNICATIONS BUFFER.
                  =3197 ;             (LOAD L6 AND R6 DATA)
                  =3198 ;  ENTRY:  R1 = NEXT AVAILABLE COMM BUFFER BYTE.
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   43
ENA09S ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

                   =3200 ;          L6 AND R6 DATA MOVED TO COMM BUFFER.
                   =3201 ;
 0F00 B824         =3202 BUF12C: MOV     R0,#L6S1
 0F02 142A         =3203         CALL    MOV38Y
 0F04 B82E         =3204         MOV     R0,#R6S1
 0F06 142A         =3205         CALL    MOV38Y
 0F08 83           =3206         RET
                   =3207 ;*****************************************************************************
                   =3208 ;  ROUTINE:  BUFMAN
                   =3209 ;  FUNCTION:  IF BUFMAN REQUEST FLAG IS NOT SET,
                   =3210 ;                THEN RETURN,
                   =3211 ;                ELSE IF COMM BUF IS BUSY
                   =3212 ;                        THEN IF NO VALID VERSIONS, CLR REQ FLAG. RETURN
                   =3213 ;                        ELSE PROCESS MESSAGE BUFFER REQUEST.
                   =3214 ;  ENTRY:  R80
                   =3215 ;          R6 VERSION FLAGS SETUP
                   =3216 ;  EXIT:  USES R0,R1,A
                   =3217 ;
                   =3218 ;  SPECIAL CHARACTERS:
                   =3219 ;                DATA "C"  = FILLER CHARACTER
                   =3220 ;                BYTE OFXN = LABEL TYPE TERMINATOR FLAG
                   =3221 ;                BYTE OCCN = TERMINATION  (ETRMBY)
                   =3222 ;
 0F09 FC           =3223 BUFMAN: MOV     A,R4
 0F0A B200         =3224         JB5     BUFM10          ;JUMP IF BUFMAN REQUEST FLAG IS SET
 0F0C 83           =3225         RET
 0F0D 72A3         =3226 BUFM10: JB3     BUFM93          ;JUMP IF COMM BUFFER IS BUSY
                   =3227 ;
 0F0F B967         =3228 BUFM20: MOV     R1,#SBUF        ;SEND BUFFER START ADDRESS
 0F11 FE           =3229         MOV     A,R6            ;GET VERSION FLAGS
 0F12 530F         =3230         ANL     A,#0FH          ;MASK VERSION POINTER
 0F14 0300         =3231         ADD     A,#0            ;SETUP CARRY FOR DA
 0F16 57           =3232         DA      A
 0F17 92A8         =3233         JB4     BUFM94          ;JUMP IF POINTER > 9.  ILLEGAL VERSION.
                   =3234 ;
 0F19 031C         =3235         ADD     A,#LOW BUFTBL
 0F1B 83           =3236         JMPP    @A
 0F1C A8           =3237 BUFTBL: DB      LOW BUFM94      ;ILLEGAL VERSION.  THIS WAS MISSED
 0F1D 26           =3238         DB      LOW BUFMA
 0F1E 2A           =3239         DB      LOW BUFM13
 0F1F 33           =3240         DB      LOW BUFME
 0F20 43           =3241         DB      LOW BUFM8
 0F21 47           =3242         DB      LOW BUFMD1
 0F22 55           =3243         DB      LOW BUFMD2
 0F23 58           =3244         DB      LOW BUFMD3
 0F24 65           =3245         DB      LOW BUFMD4
 0F25 79           =3246         DB      LOW BUFMD5
                   =3247 ;
 0F26              =3248 BUFMA   EQU     $
 0F26 F400         =3249 BUFM12: CALL    BUF12C
 0F28 E48F         =3250         JMP     BUFM90
                   =3251 ;
 0F2A 23C0         =3252 BUFM13: MOV     A,#OCCH         ;FILLER CHARACTER
 0F2C B827         =3253         MOV     R0,#L6S1+3      ;PARITY DECODE CHARACTER ADDRESS
 0F2E 30           =3254         XCHD    A,@R0   ;PUT PARITY DECODE CHAR INTO A WITH FILLER
 0F2F A1           =3255         MOV     @R1,A           ;PUT FILLER & CHAR INTO SEND BUFFER
 0F30 19           =3256         INC     R1              ;NEXT AVAILABLE BUFFER LOCATION
 0F31 E426         =3257         JMP     BUFM12          ;GO DO THE NEXT 12 CHARS
                   =3258 ;
 0F33 B1C0         =3259 BUFME:  MOV     @R1,#0C0H       ;FILLER W/ E-M/S-0 DIGIT
 0F35 19           =3260         INC     R1
 0F36 B824         =3261         MOV     R0,#L6S1
 0F38 142A         =3262         CALL    MOV38Y
 0F3A 23C0         =3263         MOV     A,#OCCH         ;FILLER CHARACTER
 0F3C B827         =3264         MOV     R0,#L6S1+3      ;PARITY DECODE CHARACTER ADDRESS
 0F3E 30           =3265         XCHD    A,@R0   ;PUT PARITY DECODE CHAR INTO A WITH FILLER
 0F3F A1           =3266         MOV     @R1,A           ;PUT FILLER & CHAR INTO SEND BUFFER
 0F40 19           =3267         INC     R1
 0F41 E48F         =3268         JMP     BUFM90
                   =3269 ;
 0F43              =3270 BUFM8   EQU     $
 0F43 B836         =3271 BUFM8L: MOV     R0,#L4S1
 0F45 E471         =3272         JMP     BUFM8R
                   =3273 ;                 ;
 0F47 B824         =3274 BUFMD1: MOV     R0,#L6S1
 0F49 142A         =3275         CALL    MOV38Y
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE  44
CHA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

 0F4D 1426        =3277          CALL    MOV2BY
 0F4F B836        =3278          MOV     R0,#L4S1     ;--- ;ALREADY SWAPPED
 0F51 1426        =3279          CALL    MOV2BY
 0F53 E48F        =3280          JMP     BUFM90
                  =3281 ;
 0F55 F400        =3282 BUFMD2:  CALL    BUF12C
 0F57 B848        =3283          MOV     R0,#N2S1
 0F59 E471        =3284          JMP     BUFM8R
                  =3285 ;
 0F5B F400        =3286 BUFMD3:  CALL    BUF12C
 0F5D B84E        =3287          MOV     R0,#N3S1
 0F5F 1426        =3288          CALL    MOV2BY
 0F61 B85A        =3289          MOV     R0,#N5S1
 0F63 E471        =3290          JMP     BUFM8R
                  =3291 ;
 0F65 F400        =3292 BUFMD4:  CALL    BUF12C
 0F67 B85A        =3293          MOV     R0,#N5S1
 0F69 1426        =3294          CALL    MOV2BY
 0F6B B842        =3295          MOV     R0,#N1S1
 0F6D 1426        =3296          CALL    MOV2BY
 0F6F B854        =3297          MOV     R0,#N4S1
 0F71 1426        =3298 BUFM8R:  CALL    MOV2BY
 0F73 B83C        =3299          MOV     R0,#R4S1
 0F75 1426        =3300          CALL    MOV2BY
 0F77 E48F        =3301          JMP     BUFM90
                  =3302 ;
 0F79 F400        =3303 BUFMD5:  CALL    BUF12C
 0F7B B854        =3304          MOV     R0,#N4S1
 0F7D 1426        =3305          CALL    MOV2BY
 0F7F B83C        =3306          MOV     R0,#R4S1
 0F81 1426        =3307          CALL    MOV2BY
 0F83 B84E        =3308          MOV     R0,#N3S1
 0F85 1426        =3309          CALL    MOV2BY
 0F87 B860        =3310          MOV     R0,#W6S1
 0F89 1426        =3311          CALL    MOV2BY
 0F8B B842        =3312          MOV     R0,#N1S1
 0F8D 1426        =3313          CALL    MOV2BY
                  =3314 ;
 0F8F FE          =3315 BUFM90:  MOV     A,R6         ;GET VERSION FLAG
 0F90 43F0        =3316          ORL     A,#0F0H      ;PUT IN TERMINATION FLAG NIBBLE
 0F92 A1          =3317          MOV     @R1,A        ;PUT TERMINATION FLAG BYTE IN BUFFER
 0F93 19          =3318          INC     R1
                  =3319 ;
 0F94 B1CC        =3320          MOV     @R1,#ETRMBY  ;LOAD THE DATA TERMINATION CHARACTER
 0F96 B966        =3321          MOV     R1,#SBFPNT   ;SEND BUFFER POINTER ADDRESS
 0F98 B1CE        =3322          MOV     @R1,#SBSTRT  ;PUT PACKED DATA START ADRS IN POINTER
 0F9A 9475        =3323          CALL    CLRVER       ;CLEAR THE VERSION POINTER/FLAG & DATA
                  =3324 ;
 0F9C FC          =3325          MOV     A,R4
 0F9D 53DF        =3326          ANL     A,#255-EBFREQ ;CLEAR THE BUFMAN REQUEST FLAG
 0F9F 4308        =3327          ORL     A,#ESBFUL    ;SET THE SEND BUFFER FULL BIT
 0FA1 AC          =3328          MOV     R4,A
 0FA2 83          =3329          RET
                  =3330 ;
 0FA3 FE          =3331 BUFM93:  MOV     A,R6
 0FA4 530F        =3332          ANL     A,#0FH       ;MASK THE VERSION POINTER/FLAG
 0FA6 96AC        =3333          JNZ     BUFM95       ;JUMP IF A VALID VERSION
                  =3334 ;
 0FA8 FC          =3335 BUFM94:  MOV     A,R4
 0FA9 53DF        =3336          ANL     A,#255-EBFREQ ;CLEAR THE BUFMAN REQUEST FLAG
 0FAB AC          =3337          MOV     R4,A
                  =3338 ;
 0FAC 83          =3339 BUFM95:  RET
                   3340 ;*****************************************
 0FAD A3          3341 TROPGF:   MOVP    A,@A
 0FAE 83          3342           RET
                  3343 ;*****************************************
 0FF7             3344           ORG     0FF7H
                  3345 ;
                  3346 ;  CHECKSUM BYTE
                  3347 ;
 0FF7 25          3348           DB      25H
                  3349 ;
                  3350 ;  DATE
                  3351 ;
 0FF8 02          3352           DB      02H,20H,88H
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ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   45
GMA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

 LOC  OBJ          LINE        SOURCE STATEMENT

 OFFA 88
                   3353 ;
                   3354 ;  PART NUMBER
                   3355 ;
 OFF8 52           3356        DB      'R',96H,01H,53H
 OFFC 96
 OFFD 01
 OFFE 53
                   3357 ;
                   3358 ;  REVISION
                   3359 ;
 OFFF 41           3360        DB      'A'
                   3361 ;*************************************
                   3362        END

USER SYMBOLS
APL3R2 0855  BADRD  0E5C  BF4CNT 0030  BF4CST 0036  BF6CNT 0012  BF6CST 0024  BUF12C 0F00  BUFM10 0F00
BUFM12 0F26  BUFM13 0F2A  BUFM20 0F0F  BUFM3  0F43  BUFM8L 0F43  BUFM8R 0F71  BUFM90 0F8F  BUFM93 0FA3
BUFM94 0FA8  BUFM95 0FAC  BUFMA  0F26  BUFMAN 0F09  BUFMD1 0F47  BUFMD2 0F55  BUFMD3 0F58  BUFMD4 0F65
BUFMD5 0F79  BUFME  0F33  BUFTBL 0F1C  CK6T10 0B9D  CK6T20 0B9F  CK6TOT 0B97  CKCCN05 0608  CKCCN10 061A
CKCCN20 0622  CKCCN30 062F  CKCCN40 063F  CKCCN45 0645  CKCCN50 064F  CKCCN60 0668  CKCCN70 0675  CKCCN80 0688
CKCCNMG 0695  CKCNOK 0693  CKCNTS 0600  CKFC10 08A7  CKFC20 08B3  CKFC80 08D9  CKFC90 08D8  CKFC95 08DF
CKFCA  08A4  CKMAJ  0837  CKMAJ9 0845  CKMISN 0848  CKMS30 0866  CKMS80 086C  CKMS90 086F  CKRCV  095E
CKRCV1 095F  CKRCV2 0966  CKRCV3 096E  CKRCV4 0977  CKRCV5 0981  CKRCV6 0989  CKRCV9 098C  CLR4SG 0806
CLR6SG 0800  CLRRAM 02A4  CLRSBF 0816  CLRSN1 0811  CLRSN8 080C  CLRT00 0810  CLRVER 0C75  COMRST 0032
CONFIG 007D  CPARTY 050E  DIBEEP 0018  DISCAN 0012  DRSN13 0710  DRSN1X 0756  DRSN3X 074E  DRSN4X 074E
DRSN5X 072F  DRSN7B 0754  DRSN7C 0758  DRSN8  075E  DRSNA  0710  DRSND1 0742  DRSND2 0748  DRSND3 0739
DRSND4 072C  DRSND5 0723  DRSNDN 0767  DRSNE  0720  DRSTBL 0713  DRSUM  007C  DRSUM1 0708  DRTIMR 0005
DRVRNG 076C  E1000N 0032  E2000M 0064  E200MS 000A  E480MS 0018  E4CH2S 0001  E6CH2S 0002  EBOMS  0004
EBOLT  0040  EBDTON 0014  EBFREQ 0020  ECASE1 087C  ECASE2 0885  ECASE3 0890  ECASE4 0896  EDECBL 000A
EDECBR 0008  EDECAL 000C  EDECAR 000D  EDECB7 0080  EDECBE 000E  EDECBF 000F  EDECBK 0040  EDECD  0020
EDECE  0010  EDECOD 000F  EDISMS 0080  EDRDLF 002A  EDRDLY 0016  EFCRST 0003  EFRRST 0001  EGDLT  0020
EGDLTV 002A  EGDTON 0004  ENCNTL 0001  ELAS0B 0010  ENOD10 0866  ENODCK 089D  ENODSN 089B  EPARID 0000
ENTREB 0002  ENBEEP 0014  ENSCAN 0011  EOCIA  0002  EP12   0004  EP13   0008  EPARID 0000  EPRDEC 0004
ER481  0002  ER482  0004  ER487  0010  ER486  0040  ER487  0080  ER684  0010  ER685  0020  ER686  0040
ER687  0080  ESBFUL 0008  ESCNG  0001  ESENT  0010  ESR4CN 0010  ESRCNR 000F  ESRF13 0020  ESRPER 0040
ESRRD  0001  ESRSDT 0080  ESUP8  0008  ETEST  0001  ETHARC 0002  ETONCT 0028  ETONE  0080  ETONFQ FFFA
ETRMBT 00CC  EUP2SP 0020  EVER00 0000  EVER13 0002  EVERB  0004  EVERA  0001  EVERD1 0005  EVERD2 0006
EVERD3 0007  EVERD4 0008  EVERD5 0009  EVERE  0003  EVLSIR 0040  EWAIT  0008  EXSBF2 0B70  EXSBF3 0B74
EXSBF4 0B78  EXSBFL 087E  EXSBFX 087A  GETLUP 0275  GOOD10 0E60  GOOD20 0E71  GOOD30 0E78  GOODRD 0E60
HCOM03 0909  HCOM05 0911  HCOM10 091A  HCOM20 0933  HCOM40 093A  HCOM50 093D  HCOM60 0942  HCOM70 0953
HCOM80 0955  HCOM90 095D  HCONN  0900  HCTBLI 094A  IFRSMG 0077  INCHKB 09AD  INCLKB 09B5  INCREM 04BD
INCX90 0980  INCXRT 09CD  INTTRP 0003  L4S1   0036  L4S2   0038  L4SCNT 003A  L4STOT 0038  L6S1   0024
L6S2   0028  L6SCNT 002C  L6STOT 002D  LOOPCK 0292  LSTUSD 007D  MAJSG0 0882  MAJSG1 08BE  MAJSG4 08C4
MAJSG5 08CE  MAJSGS 08A8  MCH28Y 09C1  MCH38Y 09C5  MCH48Y 09C9  MCHXBY 09CB  MCHXRT 0903  MOD104 085C
MOD106 0661  MOV28Y 0826  MOV38Y 082A  MOV48Y 082E  MOVXBY 0830  MRB0   0000  MRB1   0018  MRB1R3 0018
MRB1R4 001C  MTRC10 0E89  MTRC20 0E88  MTRCNK 0E84  MTRE20 0E90  MTRE30 0E9F  MTRERR 0E93  N1S1   0042
N1S2   0044  N1SCNT 0046  N1STOT 0047  N2S1   0048  N2S2   004A  N2SCNT 004C  N2STOT 004D  N3S1   004E
N3S2   0050  N3SCNT 0052  N3STOT 0053  N4S1   0054  N4S2   0056  N4SCNT 0058  N4STOT 0059  N5S1   005A
N5S2   005C  N5SCNT 005E  N5STOT 005F  N6S1   0060  N6S2   0062  N6SCNT 0064  N6STOT 0065  NEXT4  0516
POU00  039E  POU20  03C5  POU25  03CE  POU30  03D5  POUUP  039F  PRO4C2 0A62  PRO4C3 0A6A  PRO4C4 0A70
PRO4C6 0A81  PRO4C7 0A89  PRO4C8 0A8F  PRO4CN 0A51  PRO6C2 0AA4  PRO6C3 0AAB  PRO6C4 0AAE  PRO6C6 0AB0
PRO6C7 0AC1  PRO6C8 0AC7  PRO6CN 0A95  PRO7C2 0B0F  PRO7C3 0B13  PRO7C4 0B19  PRO7C6 0B28  PRO7C7 0B2C
PRO7CB 0B32  PRO7CN 0B00  PROC05 0A19  PROC3L 0A14  PROC8  0A18  PROCBL 0A20  PROCBR 0A24  PROCA  0A45
PROCAL 0A4A  PROCAR 0A4C  PROCD  0A14  PROCDN 0A2C  PROCDX 0A28  PROCE  0A30  PROCEX 0A4E  PROCNT 0A37
PROCRT 0A50  PROCSG 0AD4  R4S1   003C  R4S2   003E  R4SCNT 0040  R4STOT 0041  R6S1   002E  R6S2   0031
R6SCNT 0034  R6STOT 0035  RDT05  0ED8  RDT10  0E0A  RDT15  0E15  RDT20  0E19  RDT30  0E1F  RDT35  0E23
RDT40  0E37  RDT50  0E42  RDT60  0E48  RDT70  0E53  RDT90  0E7C  RDTAG  0E00  RSTTRP 0000  SBFEND 0078
SBFPNT 0066  SBSTRT 00CE  SBUF   0067  SBUFAD 0067  SBUFSZ 0012  SCNBUF 0020  SDATA  003F
SDATA4 0042  SDATA9 0056  SDATAH 0046  SEGBUF 0020  SEGONE 0498  SGM90  053A  SGMTCH 052A  SGSUM4 0837
SGSUM6 0838  SGSUMR 0854  SGSUMX 083C  SGSUMY 0849  STACK  0008  SUM12C 0889  SUM2BY 0704  SUM3BY 0702
SUM4BY 0700  SUP4SJ 0A00  SUP4SN 0900  SUP6SJ 0A02  SUP6SN 0998  SUPXEX 09A6  SUPXRT 0A09  TASAVE 001F
TBER4J 0000  TBER6J 0002  TBERR4 0C77  TBERR6 0C75  TBLK1  002F  TBLK13 0C80  TBLK2  0C9F  TBLK3  0066
TBLK4  0082  TBLK5  0D9E  TBLK6  0006  TBLK7  006A  TBLKB  0CC2  TBLKA  0C63  TBLKE  0CAF  TBNONE 0C7D
TBNONJ 0004  TCCCNT 0280  TCNT1  0038  TCNT2  003A  TERR02 0385  TERR04 0388  TERR06 038D  TERR08 0393
TERR10 0398  TERR12 039A  TERRUT 037F  TEST1  0261  TEST2  0245  TEST3  0248  TEST4  0258  TM000  0400
TM005  040A  TM010  040E  TM012  041A  TM014  041C  TM015  042D  TM020  0434  TM029  0436  TM030  0440
TM050  044C  TM055  0453  TM059  0455  TMSMD  0500  TIME02 0010  TIME05 0015  TIME10 0019  TIME20 001B
TIME30 001F  TIME40 0026  TIME45 002F  TIMES0 0034  TIME60 0038  TIMER  0007  TIMREG 0007  TIMTRP 0007
TMOT10 0306  TMOT20 030F  TMOT22 0311  TMOT24 0313  TMOT28 0323  TMOT40 0329  TMOT50 032F  TMOT60 0331
TMOT80 0333  TMOT90 0346  TMOT95 0348  TMOTOR 0300  TMRA10 053F  TMRAIT 0538  TONCNT 0010  TONLTN 001E
TPON   0340  TPON15 03C2  TPON20 0355  TPON30 0350  TPON40 0367  TPON50 0371  TPON60 0379  TPON90 037B
TPORET 0382  TRAN   0131  TRAN10 0133  TRAN20 0139  TRAN30 0141  TRAN40 014E  TRAN50 0158  TRAN60 0168
TRAMER 0174  TRARET 0357  TRO10  0109  TRO20  0110  TRO50  011C  TROMSN 0100  TROPG0 0057  TROPG1 0176
TROPG2 02B0  TROPG3 03E3  TROPG4 04C6  TROPG5 0543  TROPG6 0603  TROPG7 076E  TROPG8 08E4  TROPG9 0904
TROPGA 0ACC  TROPGB 0BD7  TROPGC 0CEB  TROPGD 0DE3  TROPGE 0EAB  TROPGF 0FAD  TRORET 034F  TROTAB 0121
```

```
ISIS-II MCS-48/UPI-41 MACRO ASSEMBLER, V4.2                PAGE   46
GNA095 ASSEMBLED 2/22/88 BY BLAKE ISAACS

TSC10  04A6    TSC11  0488    TSC12  0484    TSC20  047E    TSCBUF 0050    TSCNT  0462    TSEG1  0030    TSEG2  0034
TST31  0251    TST32  0255    TST41  0262    TST42  0266    TTA90  02A7    TTACNC 02A9    TTAG   020E    TTARET 0369
TTATA8 0200    UNPK1  021D    UNPK2  0222    VER13  0C60    VER8   0C5E    VERA   0C61    VERD1  0C58    VERD2  0C57
VERD3  0C56    VERD4  0C55    VERD5  0C54    VERE   0C5F    VERFLG 0006    VERT05 0C2C    VERT10 0C35    VERT15 0C3E
VERT20 0C48    VERT80 0C58    VERT90 0C62    VERTAG 0C00    WRKBUF 0079

ASSEMBLY COMPLETE,  NO ERRORS
```

```
ISIS-II ASSEMBLER SYMBOL CROSS REFERENCE, V2.1             PAGE   1

APL3A2 1625#  1639   1648   1711
BADRD  3126#
BF4CNT  251#  1514
BF4CST  211#   251   1513
BF6CNT  209#  1502
BF6CST  199#   209   1501
BUFT2C 3202#  3249   3282   3286   3292   3303
BUFN10 3224   3226#
BUFN12 3249#  3257
BUFN13 3239   3252#
BUFN20 3228#
BUFN8  3241   3270#
BUFN8L 3271#
BUFN8R 3272   3284   3290   3298#
BUFN90 3250   3268   3280   3301   3315#
BUFN93 3226   3331#
BUFN94 3233   3237   3335#
BUFN95 3333   3339#
BUFNA  3238   3248#
BUFNAR 1832   3151   3225#
BUFND1 3242   3274#
BUFND2 3243   3282#
BUFND3 3244   3286#
BUFND4 3245   3292#
BUFND5 3246   3303#
BUFNE  3240   3259#
BUFTBL 3235   3237#
CK6T10 2442#  2448
CK6T20 2441   2445#
CK6T01 2438#  2607   2646   2684
CKCDN5 1251   1254#
CKCDN10 1269#
CKCDN20 1257   1275#
CKCDN30 1262   1285#
CKCDN40 1287   1292   1296#
CKCDN45 1301#
CKCDN50 1282   1308#
CKCDN60 1321   1330#
CKCDN70 1316   1337#
CKCDN80 1345   1354#
CKCDNG 1267   1273   1278   1294   1299   1304   1306   1311   1326   1328   1333   1335   1340   1350   1352   1357   1358   1363#
CKCDNK 1272   1283   1288   1293   1305   1327   1334   1351   1360#
CKCNTS 1244#  3108
CKFC10 1734   1737#
CKFC20 1739   1744#
CKFC80 1777   1781#
CKFC90 1748   1779   1783#
CKFC95 1741   1747   1787#
CKFCA   616   1734#  3068   3079   3105
CKNAJ  2306#  2466   2473   2482
CKNAJ9 2312   2318#
CKNISM 2336#  2470   2477   2489
CKNS30 2352   2369#
CKNS80 2358   2364   2371   2376#
CKNS90 2357   2347   2379#
CKRCV  1824   1906#
CKRCV1 1909#
CKRCV2 1910   1914#
CKRCV3 1916   1920#
CKRCV4 1922   1928#
CKRCV5 1930   1937#
CKRCV6 1939   1943#
CKRCV9 1946#
CLR4SG 1513#  2624
CLR6SG  608   1501#  2623
CLRRAM  651#   652
CLRSBF 1544#  1898
CLRSM1 1528#  1530   1554
CLRSMB 1525#  1778   2125   3050
CLRTOO 1503   1515   1527#
CLRVER 2622#  3049   3323
CONRST  155#  1938
CONFIG  269#   831   2517   2536   2549
CPARTY  935   1132   1153#
DIBEEP  154#  1929
DISCAN  152#  1915
DRSH13 1417   1427#
DRSH1X 1457   1466#
DRSH3X 1451   1461#
```

ISIS-II ASSEMBLER SYMBOL CROSS REFERENCE, V2.1 PAGE 2

```
DRSM4X 1445  1462#
DRSM5X 1437  1441#
DRSM7B 1428  1465#
DRSM7C 1431  1467#
DRSM8  1419  1471#
DRSMA  1416  1426#
DRSMD1 1420  1453#
DRSMD2 1421  1459#
DRSMD3 1422  1447#
DRSMD4 1423  1439#
DRSMD5 1424  1433#
DRSMDN 1469  1477#
DRSME  1418  1430#
DRSTBL 1413  1415#
DRSUM   266#  1477
DRSUMT 1407#  3132  3138
DRTIMR  178#
DRVRNG 1411  1415  1482#
E1000N  134#   808   856  1033
E2000N  135#
E200MS  132#
E480MS  133#
E4CM2S  126#
E6CM2S  127#
EBOMS   131#   853
EBDLT    46#   377   695   698   701   787   862   913   944  3089  3096  3140  3183  3185
EBDTON  138#
EBFREQ  102#  3045  3149  3326  3336
ECASE1 1668  1676#
ECASE2 1669  1685#
ECASE3 1671  1696#
ECASE4 1672  1693  1705#
EDECBL   74#
EDECBR   75#
EDECAL   76#
EDECAR   77#
EDECB7   83#
EDECBE   78#
EDECBF   79#
EDECBK   82#  1988
EDECD    81#  2651  2689  2846
EDECE    80#  2651  2717
EDECOD   73#
EDISMS   55#
EDRDLF  162#
EDRDLY  161#  3061
EFCRST   68#   534   835   864  1043
EFRRST   66#  1783
EGDLT    45#   376   695   698   701   727   730   786   851   861   913  3088  3095  3141  3171
EGDLTW  160#  3063
EGDTON  137#  3145
ENCNTL  170#   366
ELASD8   44#   377   569   669   831   855   861   914  1030  1056  1911  1917  3170
EMOD10 1660#  2115
EMODCK 1715#
EMODSN 1681  1711#
ENSNBY  147#
ENTREB   41#   377   669   682   703   734   862  3171
ENBEEP  153#  1921
ENSCAN  151#  1909
EOCIA    67#   363  1136
EP12     42#   569   831  1814  1820
EP13     43#   569   831
EPARRD   64#
EPRDEC   69#  1771
ER481    98#
ER482    99#
ER484   101#
ER486   103#
ER487   104#
ER484   119#
ER485   120#
ER486   121#
ER487   122#
ESBFUL  100#  1545  3045  3327
ESCMG    97#   613  3075
ESENT    52#
ESR4CN   88#
ESRCNR   87#
```

ISIS-II ASSEMBLER SYMBOL CROSS REFERENCE, V2.1 PAGE 3

```
ESRF13  89#
ESRPER  90#
ESRRD   65#  1049  1737
ESRSDT  91#
ESUP8   1448  1812  1894
ETEST   38#  536  569  765
ETKARX  40#  583  585  597  599  765
ETONCT  1408  334  796  845  878
ETONE   47#  328  330  347  569  831
ETONF0  1418  350
ETRNBY  1458  1850  3320
EUP2SP  53#
EVER00  108#
EVER13  110#
EVER8   112#
EVERA   109#
EVERD1  113#
EVERD2  114#
EVERD3  115#
EVERD4  116#
EVERD5  117#
EVERE   111#
EVLSIR  54#  828  830
EVAIT   159#  160  161  162  1743  1781
EXSBF2 2392#  2487
EXSBF3 2394#  2476
EXSBF4 2396#  2469
EXSBFL 2402#  2407
EXSBFX 2393  2395  2397#
GETLUP  615#  619
GOOD10 3129  3137#
GOOD20 3134  3140#
GOOD30 3144  3166#
GOODRD 3119  3127#
HCON03 1817#  1819
HCON05 1808  1828#
HCON10 1829  1835#
HCON20 1854  1857#
HCON40 1863#
HCON50 1847  1867#
HCON60 1871#
HCON70 1851  1891#
HCON80 1864  1876  1894#
HCON90 1831  1835  1860  1897  1899#
HCONM  758  1806#  2511  3055  3069  3078  3094  3104  3117  3124  3127
HCTBL1 1869  1879#
IFRSNG  1568  1944
INCHN8 2010#  2186  2236  2288
INCLN8 2016#  2162  2219  2271
INCREM 1098  1100#
INCX90 2014  2023#
INCXRT 2013  2020  2027#
INTTRP  2848
L4S1  212#  1456  1472  2759  2869  3271  3278
L4S2  213#
L4SCNT  214#  2093  2480
L4STOT  215#  1264  1301  2749  2854
L6S1  200#  634  1280  1285  1467  2260  2420  2468  2610  2649  2662  2687  2715  2844  2859  3202  3253  3261
      3264  3276
L6S2  201#  1290  2277
L6SCNT  202#  622  2257  2270  2274  2287  2465
L6STOT  203#  1259  1275  2291  2438  2710  2741  2839
LOOPCK  636#  643  648
LSTUSD  271#
MAJSC0 2467  2470#
MAJSC1 2474  2477#
MAJSC4 2482#  2493
MAJSC5 2483  2489#
MAJSC6 2465#  2510
MCH2BY 2044#  2157  2181
MCH3BY 2046#  2215  2232
MCH4BY 2048#  2267  2284
MCHDBY 2045  2047  2049#  2054
MCHXRT 2051  2055#
MOD104 1638#  2760  2763  2807  2811  2817  2864  2878  2909  2913  2944  2948  2979  2983  3019  3023  3029
MOD106 1647#  2621  2625  2860
MOV2BY 1566#  2151  2175  3277  3279  3288  3294  3296  3298  3300  3305  3307  3309  3311  3313
MOV3BY 1568#  1662  2212  2229  3203  3205  3262  3275
MOV4BY 1570#  2264  2281
```

```
MOVXBY 1567  1569  1571#  1575
MRB0   176#
MRB1   186#
MRB1R3 187#
MRB1R4 188#
MTRC10 3157  3160#
MTRC20 3161# 3162
MTRCNK 3054  3084  3103  3155#
MTRE20 3178# 3184  3186
MTRE30 3179# 3180
MTRERR 3166  3170#
N1S1   222#  1444  2947  3028  3295  3312
N1S2   223#
N1SCNT 224#  2107
N1STOT 225#  1337  2938  3013
N2S1   227#  1460  2908  3283
N2S2   228#
N2SCNT 229#  2108
N2STOT 230#  1323  2898
N3S1   232#  1436  1450  2806  3018  3287  3308
N3S2   233#
N3SCNT 234#  2109
N3STOT 235#  1330  1354  2791  3003
N4S1   237#  1442  2978  3297  3304
N4S2   238#
N4SCNT 239#  2110
N4STOT 240#  1313  2968
N5S1   242#  1440  1448  2810  2943  3285  3293
N5S2   243#
N5SCNT 244#  2111
N5STOT 245#  1318  1347  2796  2933
N6S1   247#  1434  1454  2863  3022  3276  3310
N6S2   248#
N6SCNT 249#  2112
N6STOT 250#  1296  1342  2849  3008
NEXT4  1087  1164#
POU00  819#  825
POU20  861#
POU25  867#  868
POU30  874#  875
POUUP  281   820#
PRO4C2 2146  2154#
PRO4C3 2152  2160#
PRO4C4 2158  2165#
PRO4C6 2170  2178#
PRO4C7 2176  2184#
PRO4C8 2182  2189#
PRO4CN 2094  2096  2106  2141#
PRO6C2 2210  2215#
PRO6C3 2213  2218#
PRO6C4 2216  2222#
PRO6C6 2227  2232#
PRO6C7 2230  2235#
PRO6C8 2233  2239#
PRO6CN 2123  2205#
PRO7C2 2262  2267#
PRO7C3 2265  2270#
PRO7C4 2268  2274#
PRO7C6 2279  2284#
PRO7C7 2282  2287#
PRO7C8 2285  2291#
PRO7CN 2087  2117  2122  2257#
PROC05 2082  2089#
PROC3L 2084#
PROC8  2090#
PROC8L 2093#
PROC8R 2092  2095#
PROCA  2089  2119#
PROCAL 2122#
PROCAR 2121  2123#
PROCD  2085# 2099
PROCDN 2100#
PROCDX 2077  2098#
PROCE  2078  2114#
PROCEX 2116  2125# 2163  2187  2193  2220  2237  2241  2272  2289  2293
PROCNT 2103  2107#
PROCRT 2075  2126#
PROCSG 617   2073# 3106
R4S1   217#  1463  1474  2762  2816  2912  2982  3299  3306
```

ISIS-II ASSEMBLER SYMBOL CROSS REFERENCE, V2.1 PAGE 5

```
R4S2     218#
R4SCNT   219#  2095
R4STOT   220#  1269   1308   2754   2801   2903   2973
R6S1     205#   645   1465   2208   2424   2475   3204
R6S2     206#  2225
R6SCNT   207#   629   2205   2218   2222   2235   2472
R6STOT   208#  1254   2239   2445   2720   2745
RDT05   3047   3050#
RDT10   3054#  3059   3070
RDT15   3063#
RDT20   3056   3068#
RDT30   3064   3074#
RDT35   3078#  3087   3090
RDT40   3082   3094#
RDT50   3103#  3113   3122
RDT60   3099   3106#
RDT70   3110   3117#
RDT90   3148#
RDTAG    885   3044#  3098   3125   3135   3152
RSTTRP   280#   778    933   1067   1961
SBFEND   260#
SBFPNT   254#  1548   1837   1867   3321
SBSTRT   258#  1549   3322
SBUF     257#   258    259   1551   3228
SBUFAD   256#
SBUFSZ   259#  1552
SCNBUF   197#  1525   1660   1664   1715   1749   1962   1972   2073   2145   2169   2209   2226   2261   2278   3080
SCNFLG   177#
SDATA    363#  1788
SDATA4   366#
SDATA9   367    380#
SDATAN   368#
SEGBUF   196#
SEGORE  1092   1099#
SGM90   1201   1206   1211#
SGNTCN  1090   1095   1198#
SGSUM4  1588#  1638
SGSUM6  1592#  1647   1680   1706
SGSUMR  1612   1617#
SGSUMX  1590   1593#
SGSUMY  1600   1605#
STACK    183#   393
SUM12C  2420#  2616   2659   2692
SUM2BY  1392#  1435   1441   1443   1449   1455   1462   1464   1473   1475
SUM3BY  1390#  1466
SUM4BY  1388#  1468
SUP4SJ  2070#  2091   2101
SUP4SR  1962#  2070
SUP6SJ  2071#  2086   2114   2120
SUP6SR  1972#  2071
SUPXEX  1970   1986#
SUPXRT  1990   2077#
TASAVE   191#
TBERRJ  2787#  2821   2917   2952   2987   3033
TBERRJ  2788#  2882
TBERR4  2624#  2743   2747   2767   2787
TBERR6  2617   2623#  2667   2693   2722   2788
TBLK1   2541   2839#
TBLK13  2525   2646#
TBLK2   2528   2684#
TBLK3   2560   2898#
TBLK4   2567   2933#
TBLK5   2554   2968#
TBLK6   2557   2791#
TBLK7   2564   3003#
TBLK8   2544   2741#
TBLKA   2522   2607#
TBLKE   2532   2710#
TBNOKE  2608   2614   2628#  2647   2652   2657   2685   2690   2713   2718   2752   2757   2789
TBNOKJ  2789#  2794   2799   2804   2842   2847   2852   2857   2901   2906   2936   2941   2971   2976   3006   3011   3016
TCCONT   623#   631
TCNT1    167#   977   1035   1099
TCNT2    168#  1097
TERR02   792#
TERR04   795#   806
TERR06   798#   799
TERR08   803#   804
TERR10   793    808#
TERR12   809#   810
```

```
TERRVT  777   786#  3174
TEST1   574#  605
TEST2   576#  604
TEST3   579#  579
TEST4   592#  592
TH000   909#  937   942   961   964   968   992
TH005   378   915#  916   925   945   963
TH010   915   921#
TH012   933#
TH014   932   935#
TH015   939   949#
TH020   950   954#
TH029   953   959#
TH030   962   968#
TH050   978#  988
TH055   979   983#
TH059   982   985#
THSMD   974   987   991   1129#  1130
TIME02  309   312#
TIME05  314   317#
TIME10  318   321#  348
TIME20  322#  351
TIME30  306   327#
TIME40  329   332#
TIME45  337   340#
TIME50  342   345#
TIME60  333   346   350#
TIMER   303#
TIMREG  180#
TIMTRP  287#
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TMOT40  705#  706
TMOT50  679   712#
TMOT60  713#  728   731
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TMOTOR  669#  770
TMWAIT  1228#  1229
TMWAIT  1032   1223#
TONCNT  189#
TONLTH  190#
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TPON15  857#  858
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TRAN20  464#  467
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TRAN40  483#  491
TRAN50  495#  503
TRAN60  507#  515
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TROPG0  382#  433   --
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TROPG9  442   2057#
TROPGA  443   2243#
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ISIS-II ASSEMBLER SYMBOL CROSS REFERENCE, V2.1                    PAGE  7

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TROPGF  448   3341#
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TROTAB  407    433#
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TSC05  1050#
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TSC07  1059#  1084
TSC08  1050   1068#
TSC09  1066   1077#
TSC10  1079   1086#
TSC11  1067#  1070
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TST32   584    589#
TST41   596    599#
TST42   598    603#
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TTACNK  635    656#
TTAG    534#   764
TTARET  654    765#
TTATAB  532#   537
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VERT20 2555   2564#
VERT80 2580#
VERT90 2588#
VERTAG 2510#  3118
WRKBUF  263#  1661   1676   1685   1696   1705

CROSS REFERENCE COMPLETE
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It can be seen therefore that the use of a common interface according to the present invention in a combined scanner and scale system provides significant advantages over prior art systems in which the scanner and the scale do not share an interface. Only a single connector cable and only a single port of the cash register system are require to connect both the scale and the scanner to the cash register system. Further the costs associated with the scanner and the scale having dedicated interface circuits are eliminated by the sharing of an interface circuit according to the present invention.

Having described the invention in detail and by reference to the preferred embodiment thereof, it will be apparent that other modifications and variations are possible without departing from the scope of the invention defined in the appended claims.

Claims

1. A data gathering system for use in a checkout counter to determine information relating to products to be purchased and to provide such information to a cash register system, comprising:
scale means supported within said checkout counter for determining weights of products presented to said data gathering system, said scale means including a subplatter located below the upper surface of said checkout counter,
optical scanning means supported upon said subplatter for reading coded labels on said products, and
a common interface circuit, response to both said scale means and said optical scanning means, for

providing weight data and coded label data to said cash register system.

2. A data gathering system for use in a checkout counter as claimed in claim 1 further comprising support means for suspending said data gathering system within said checkout counter, said scale means being secured to said support means.

3. A data gathering system for use in a checkout counter to determine information relating to products to be purchased, including weight data and coded label data, and to supply said information to a cash register system, said counter defining an upper surface upon which products are placed for access to said data gathering system, comprising:

support means for suspending said data gathering system within said checkout counter,

scale means secured to said support means for determining weights of products presented to said data gathering system, said scale means including a subplatter located below the upper surface of said checkout counter,

optical scanning means supported upon said subplatter for reading coded labels on said products, said optical scanning means having an upper surface including an optical scanning window, said optical scanning means being sized such that its upper surface is substantially aligned with the upper surface of said checkout counter when supported upon said subplatter, and

a common interface circuit, responsive to both said scale means and said optical scanning means, for providing both weight data and coded label data to said cash register system.

4. A data gathering system for use in a checkout counter as claimed in claim 1,2 or 3, wherein said subplatter includes scanner locator means for positioning said optical scanning means on said subplatter for assembly of said data gathering system.

5. A data gathering system for use in a checkout counter as claimed in claim 1,2,3 or 4 in which said optical scanning means includes a bar code decoder circuit for decoding scan signals to provide coded label data, a scanner microprocessor for correlating coded label data and supplying said coded label data to said common interface circuit, and memory means for storing control software for use by said scanner microprocessor.

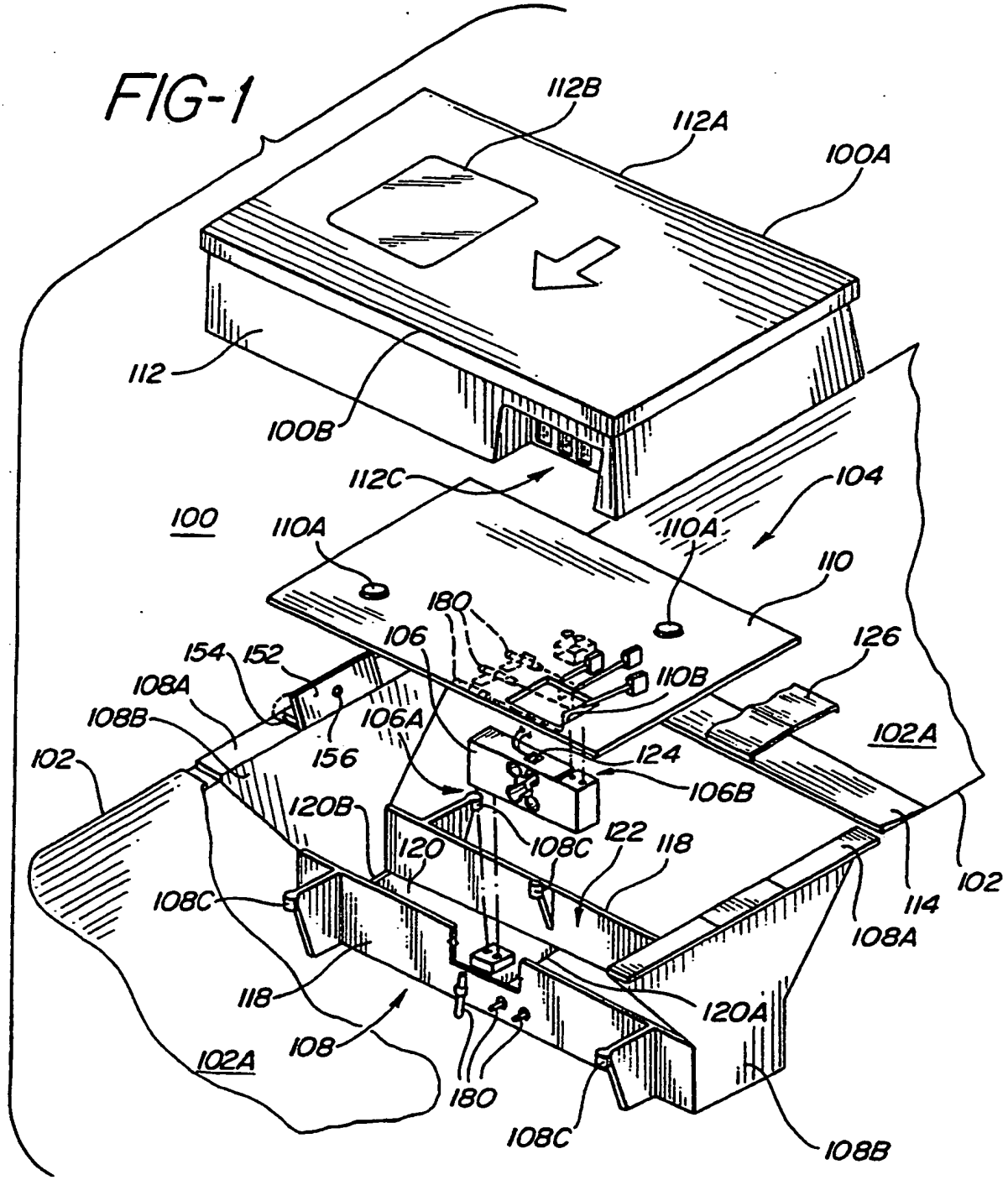
6 . A data gathering system for use in a checkout counter as claimed in claim 5 , in which said scale means supplies weight data to said bar code decoder circuit of said optical scanning means, and said bar code decoder circuit supplies said weight data to said common interface circuit via said scanner microprocessor without alteration.

7. A data gathering system for use in a checkout counter as claimed in any preceding claim, in which said common interface circuit comprises an interface microprocessor, responsive to coded label data from said optical scanning means and to weight data from said scale means, memory means for storing control software for use by said interface microprocessor, and a driver circuit, responsive to said interface microprocessor, for supplying weight data and coded label data to said cash register system.

8. A data gathering system for use in a checkout counter as claimed in claim 6 or7 in which said scale means supplies weight data directly to said common interface circuit.

9. A data gathering system for use in a checkout counter as claimed in claim 6,7 or 8, further comprising cables connected between said scale means and said optical scanning means for conducting electrical signals and power, said cables being sized, positioned and secured to prevent interference with the operation of said scale means.

FIG-1



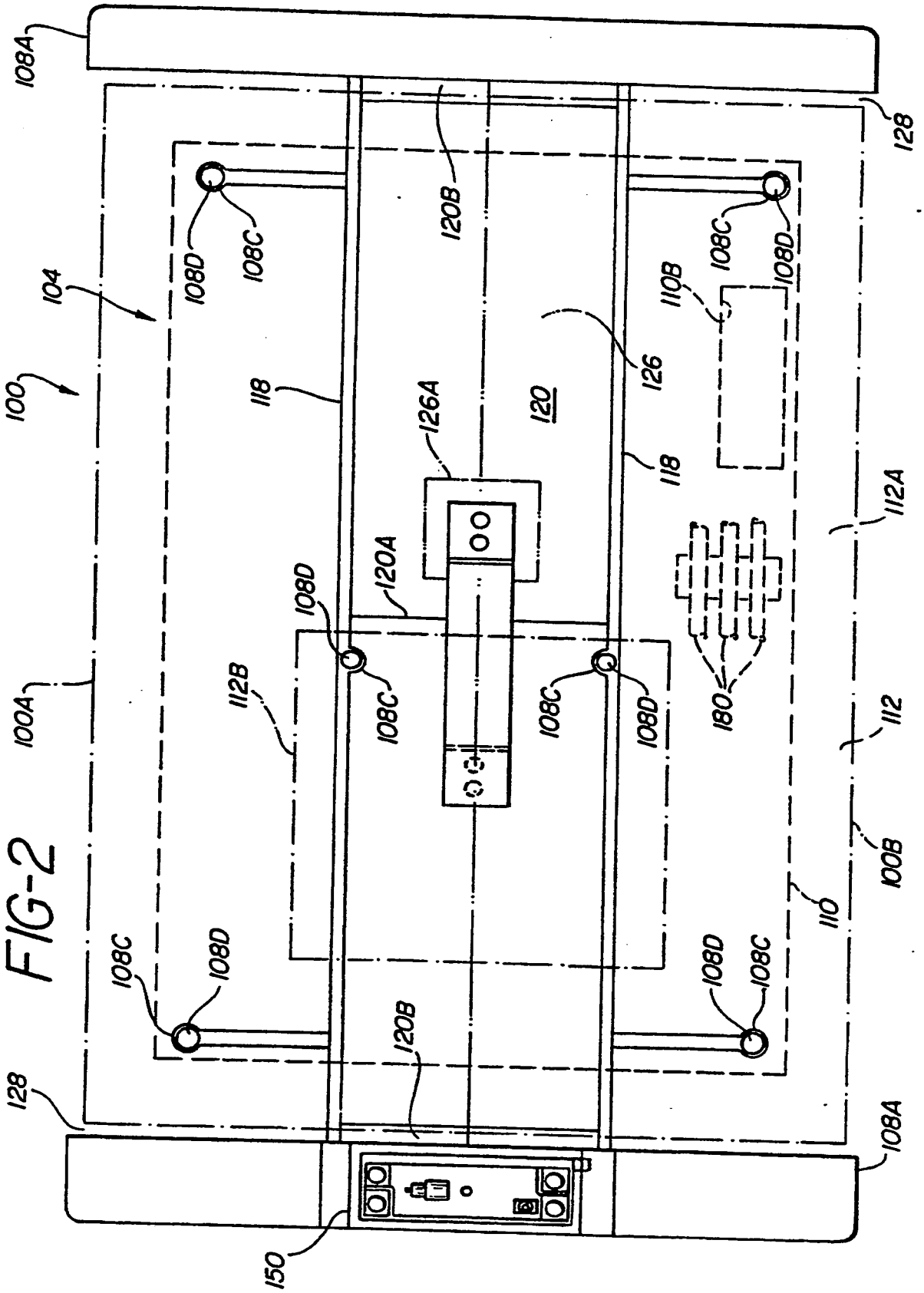
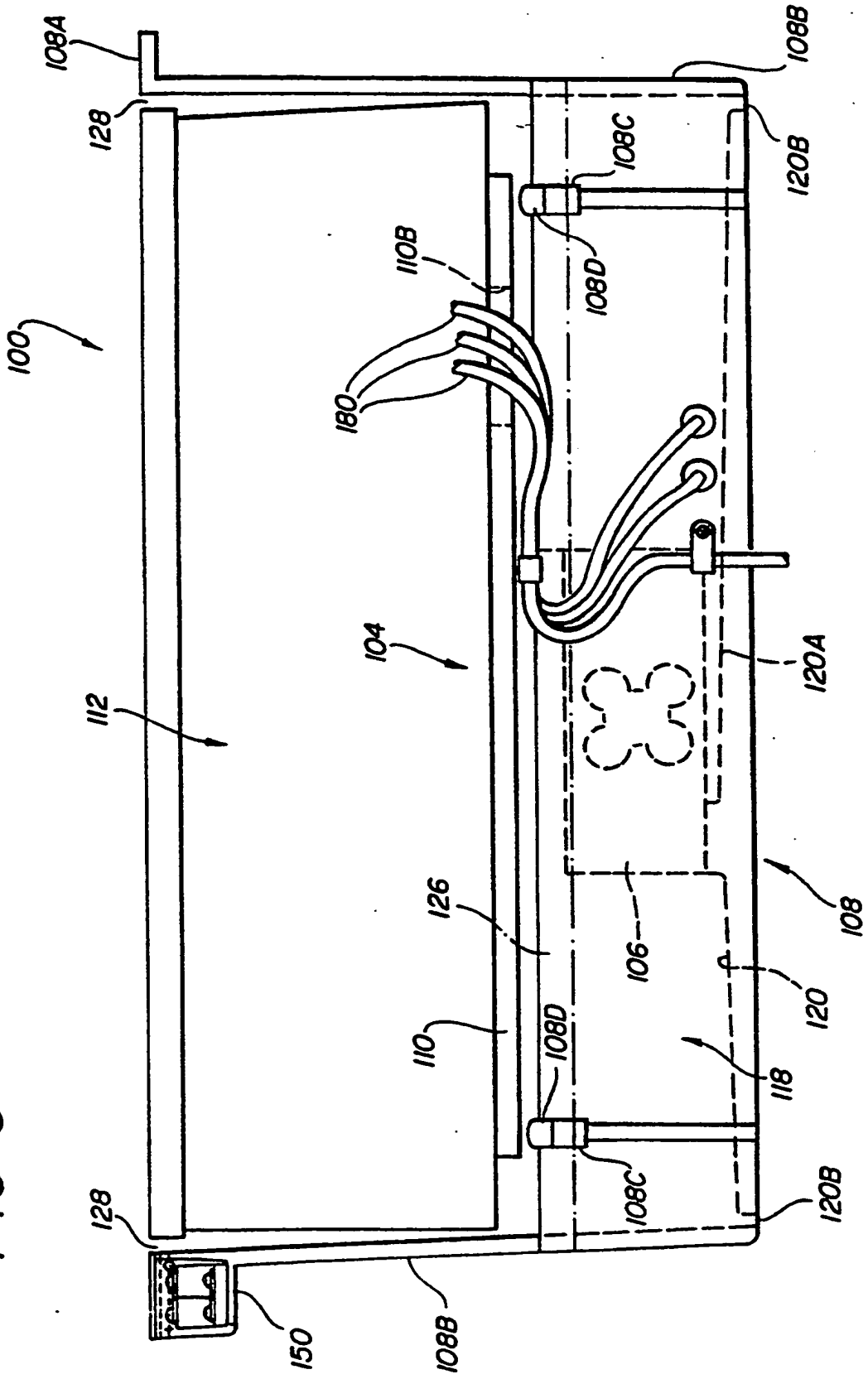


FIG-2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110B
108D
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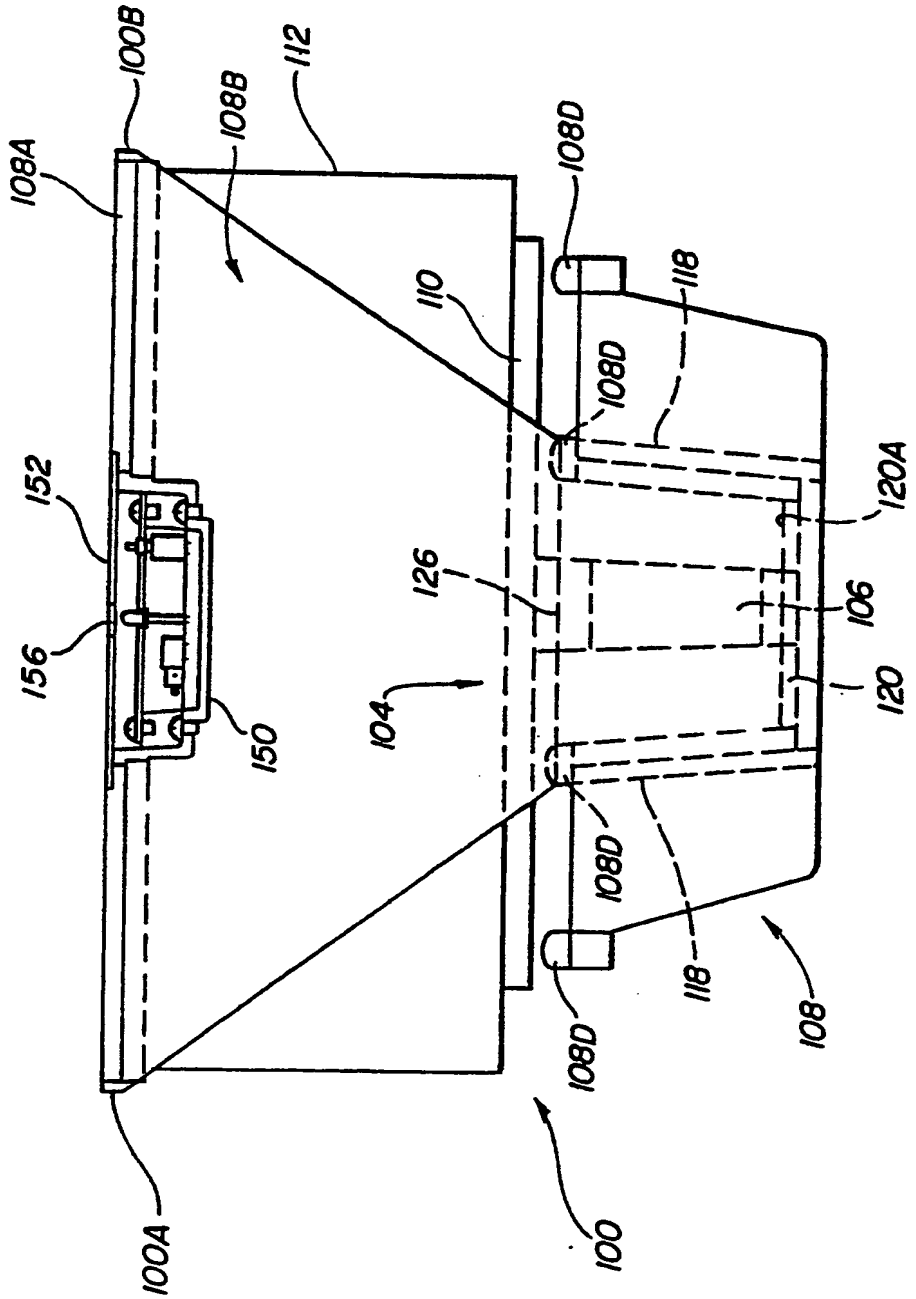
108C
120B
128
150
108B

FIG-3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108A
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104
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108D
118
108
108D
100A
100

FIG-4

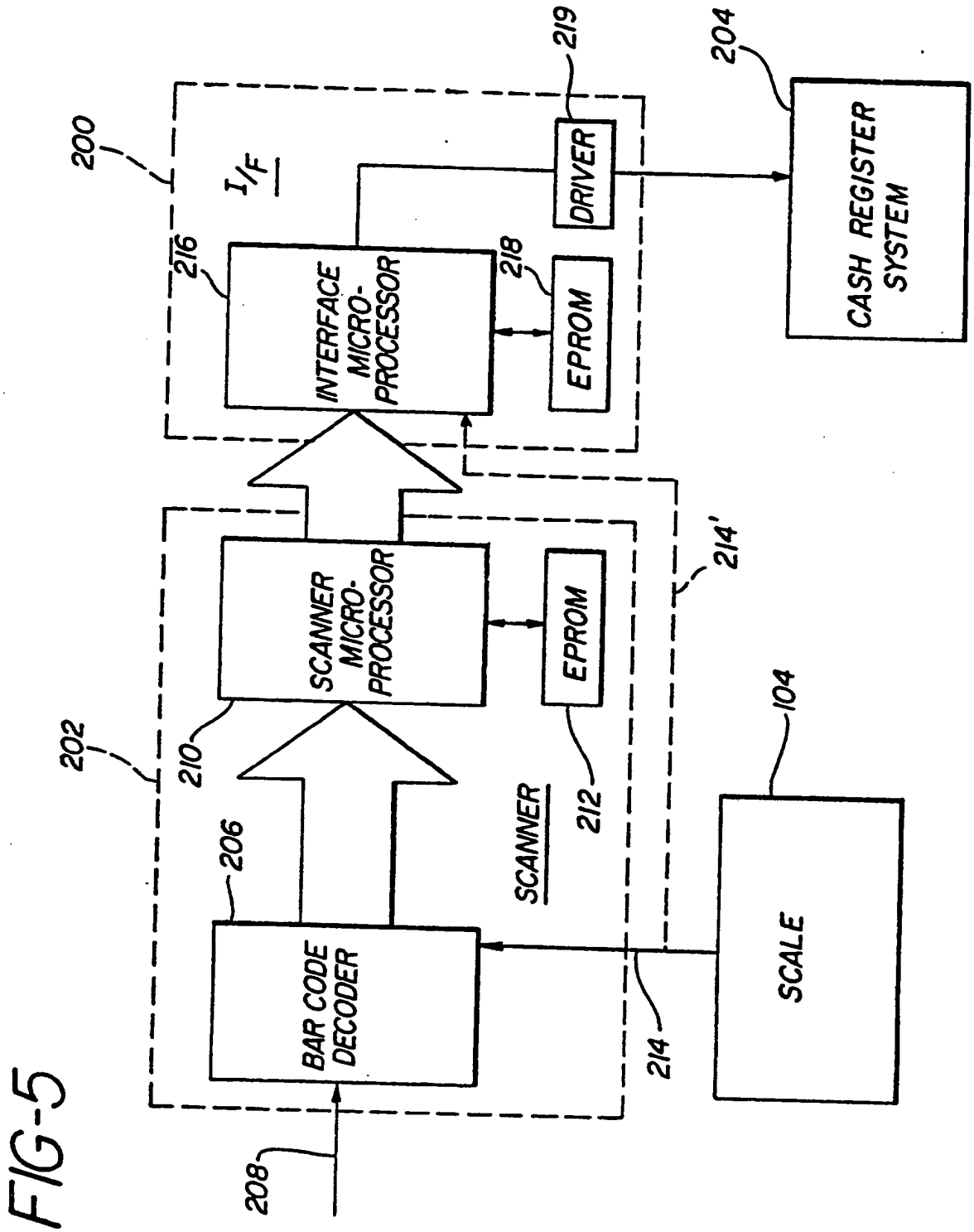

FIG-5

(19) Europäisches Patentamt
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(71) Applicant: **SPECTRA PHYSICS INC.**
3333 North First Street
San Jose California 95134-1995(US)

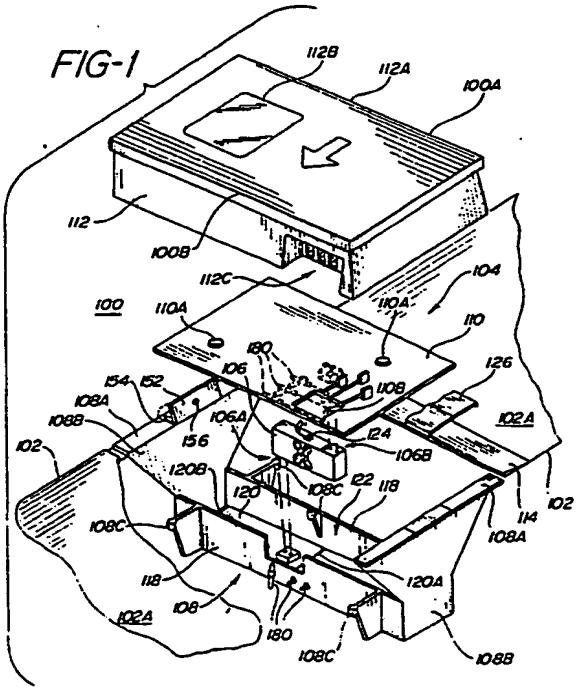
(72) Inventor: **Taussig, Andrew Peter**
2515 West 22nd Avenue
Eugene Oregon 97405(US)
Inventor: **Isaacs, Blake L.**
748 Granite Place
Springfield Oregon 97477(US)

(74) Representative: **Murgatroyd, Susan Elizabeth et al**
Baron & Warren 18 South End
Kensingtonton
London W8 5BU(GB)

(54) **Data gathering system interface.**

(57) A data gathering system (100) for use in a checkout counter (102) to determine information relating to products to be purchased and to provide such information to a cash register system includes a scale (104) supported within the checkout counter (102) for determining weights of products presented to the data gathering system (100). The scale (104) includes a subplatter (110) located below the upper surface of the checkout counter(102). An optical scanning arrangement (112) is supported on the subplatter (110) for reading coded labels on the products. A common interface circuit (200) is responsive to both the scale (104) and the optical scanning arrangement(112) for providing weight data and coded label data to the cash register system.

FIG-1



EP 0 388 560 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 31 3390

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X,X,P	JP-A-6 210 839 (TOKYO ELECTRIC CO.) * the whole document & US-A-4879650 (KURIMOTO ET.AL.) 07 November 1989 *	1-9	G 07 G 1/12 G 06 K 7/10 G 01 G 19/413 G 01 G 19/415
X,A	US-A-4 716 281 (AMACHER ET.AL.) * abstract; claims 1-9; figures 1-8 * * column 1, line 28 - column 7, line 9 *	1,2-9	
D,A	WO-A-8 605 270 (NCR CORPORATION) * the whole document *	1-9	
A	WO-A-8 804 813 (NCR CORPORATION) * abstract; claim 4; figures 1-3 *	1-6	
A	EP-A-0 168 627 (TOKYO ELECTRIC CO.) * abstract; claims 1-5; figures 1-5 *	1-5	
A	EP-A-0 178 223 (GRO-EST) * abstract; claims 1-3; figures 1, 2 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

G 07 G
G 06 K
G 01 G
A 47 F

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	08 November 90	GUIVOL,O.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document